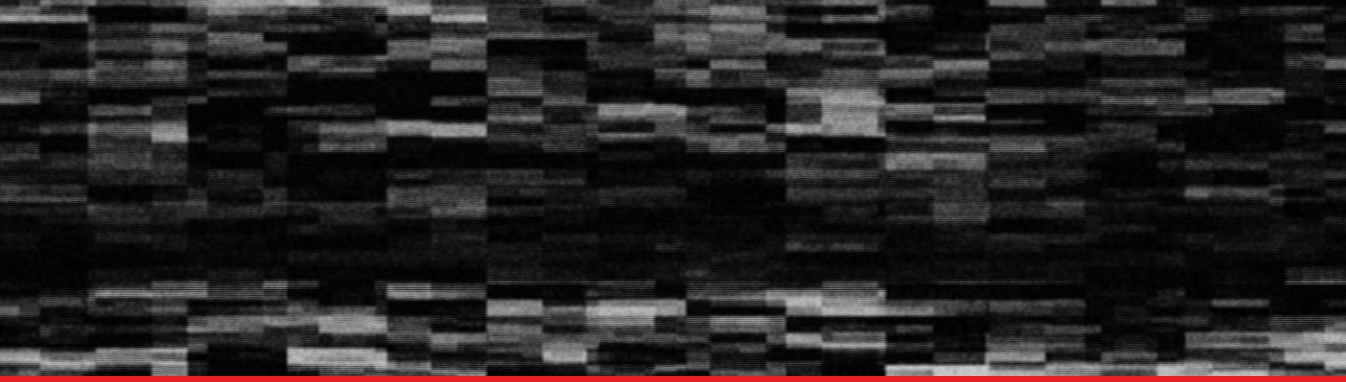
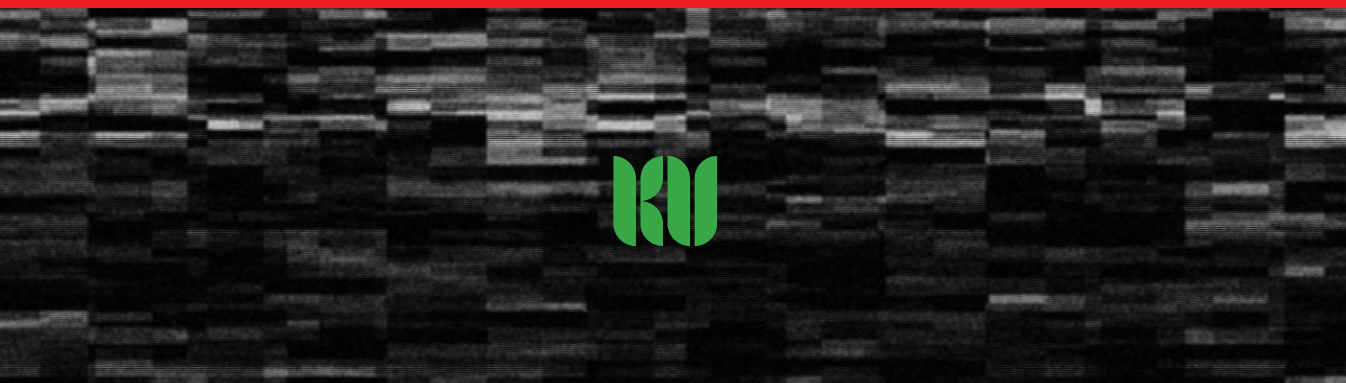


IntechOpen

An International Collection of Multidisciplinary Approaches to Violence and Aggression

Edited by Catherine Lewis



An International Collection of Multidisciplinary Approaches to Violence and Aggression

Edited by Catherine Lewis

Published in London, United Kingdom

An International Collection of Multidisciplinary Approaches to Violence and Aggression
http://dx.doi.org/10.5772/intechopen.100654
Edited by Catherine Lewis

Contributors
Jean Gagnon, Adriana Ursulet, Émilie De Repentigny, Joyce E. Quansah, Monique Bessette, Zachary P. Pierce, Eric Johnson, Tiffany Hollis, Angélica Quiroga-Garza, María José Almela-Ojeda, Macpherson Uchenna Nnam, Mary Juachi Eteng, Noelia Rodríguez-Espartal, Daniela Ramírez Meneses, Toivo Koivukoski, Paul McNicoll, David Richard, Sherine Abdelmissih, Raquel Perez-Aloe, Miguel Á. Domínguez, Juan M. Carrillo, Bruno Pérez, Javier Lozano

First published in London, United Kingdom, 2023 by IntechOpen
IntechOpen is the global imprint of INTECHOPEN LIMITED, registered in England and Wales, registration number: 11086078, 5 Princes Gate Court, London, SW7 2QJ, United Kingdom

British Library Cataloguing-in-Publication Data
A catalogue record for this book is available from the British Library

Additional hard and PDF copies can be obtained from orders@intechopen.com

An International Collection of Multidisciplinary Approaches to Violence and Aggression
Edited by Catherine Lewis
p. cm.
Print ISBN 978-1-80355-306-1
Online ISBN 978-1-80355-307-8
eBook (PDF) ISBN 978-1-80355-308-5

An electronic version of this book is freely available, thanks to the partial funding support of libraries working with Knowledge Unlatched. KU is a collaborative initiative designed to make high quality books Open Access for the public good. More information about the initiative and links to the Open Access version can be found at www.knowledgeunlatched.org

Meet the editor

Catherine Lewis is a counselling psychologist and a fellow of the Higher Education Academy. She is a senior lecturer in counselling psychology at London Metropolitan University. She has more than 15 years of clinical experience in various clinical settings in the United Kingdom and she specializes in psychodynamic, cognitive-behavioral therapy, and integrative models of practice. Dr. Lewis has authored many papers in the fields of counselling psychology and psychotherapy and has collaborated with other researchers on numerous projects.

Contents

Preface

The literature on violence and aggression is rich yet scattered. From the days of Nietzsche's moral philosophy on the opposition of master and slave to Freud's psychoanalytic conception of Thanatos, and from the realm of social theory to affective neuroscience, researchers and clinicians agree on one thing: that aggression is at the core of the human condition.

This book contributes to existing knowledge on violence and aggression by synthesizing theories and empirical data from a variety of scientific paradigms to facilitate a constructive meta-dialogue about a topic that feels uncomfortably stimulating and perpetually consequential. It presents a broad-based, multidisciplinary approach to aggression, conflict, and violence rooted in psychological, sociocultural, and contextual models.

This volume is a collection of theoretical perspectives and studies from international scholars that adds to existing knowledge on neuropsychological aspects of aggression, personality features, gender-based violence, and cultural origins of conflict. The chapters are authored by experts from across the globe and their contributions offer important insights into major theoretical perspectives on aggression and violence as well as the multifaceted factors involved in the etiology and management of conflict. Adopting an international focus, the book synthesizes lived experiences and perspectives from Western and non-Western frameworks of violence, broadening the spectrum of the shared knowledge base. It is useful for researchers, students, and readers interested in the etiology, assessment, and management of aggression.

Dr. Catherine Lewis
Senior Lecturer in Psychology,
London Metropolitan University,
London, UK

Chapter 1

Sexual Abuse in Childhood: Emerging Syndromes in Adulthood

Angélica Quiroga-Garza and María José Almela-Ojeda

Abstract

The high prevalence in Mexico of both child sexual abuse and emerging psychopathological syndromes in adulthood, particularly post-traumatic stress disorder, self-injurious behavior, and suicide, makes it necessary to investigate in greater depth the relationship between these circumstances. The findings on the incidence in Mexico and the interaction of these variables would make it possible to propose public policies with scientific support for the protection of children and to design intervention programs for adult victims of child abuse at risk due to psychopathological symptoms. To understand the interaction of child abuse events and adult emerging syndromes in the Mexican population, we conducted quantitative, correlational-comparative research. The findings have implications for clinical and social practice. It is necessary to continue working with families, carrying out preventive measures for all forms of domestic violence (physical, sexual, economic, negligence) that cause intentional harm to the children who suffer it, and its consequences remain until adult life.

Keywords: child sexual abuse, post-traumatic stress disorder, self-injurious behavior, suicide, psychopathological syndromes

1. Introduction

In 2006, the World Health Organization (WHO) launched the World Mental Health Survey Initiative whose results suggested that 30% of all mental disorders in adults were related to adverse childhood experiences (ACE) [1]. Exposures to personal abuse and neglect before the age of 18 are known as childhood trauma [2]. Psychological trauma arises when a painful event exceeds the coping skills of the person who experiences it [3]. The traumatic experience can be a single event or frequently repeated events [4, 5], such as in chronic victimization. Anticipation and fear can trigger defense mechanisms such as dissociation, resulting in greater difficulty remembering the trauma [5]. So, if traumatic events occur in children's early life, particularly before the age of five—a critical developmental period—they impact mental health and well-being throughout life [6–10].

In this regard, since 2016, Mexico has been ranked first worldwide in sexual abuse, physical violence, and homicide of children under 14 years of age with 5.4 million cases per year, being only 2% of the cases reported at the time, the rest they are known after years of abuse [11]. Although a direct and reliable source on the real

numbers on this problem is considered non-existent since innumerable cases are not reported [12]. This situation has become a public policy problem in Mexico. Hence the importance of further investigating the relationship between emergent psychopathological syndromes in adulthood and traumatic events in childhood, particularly child sexual abuse.

The high prevalence in Mexico of both child sexual abuse and emerging psychopathological syndromes in adulthood, particularly post-traumatic stress disorder, self-injurious behavior, and suicide, makes it necessary to investigate in greater depth the relationship between these circumstances. The findings on the incidence in Mexico and the interaction of these variables would make it possible to propose public policies with scientific support for the protection of children and to design intervention programs for adult victims of child abuse at risk due to psychopathological symptoms.

2. Child sexual abuse and emerging psychopathological syndromes in adulthood

The prevalence of child sexual abuse (CSE) is close to one in 10 children worldwide [13]. In Mexico, more than 50,000 minors are victims per year [14] and less than 10% of what really happens in the country is reported [15]. There are several social reasons for not doing so, p.e., the authorities in charge of receiving the reports take a long time to start an investigation file, most people distrust authority, and the procedures are usually long hindering and even re-victimizing the person [16].

There are some other reasons regarding the victims. Boys and girls do not fully understand what happened, and it is difficult for them to communicate the event and usually, they simply know that it has caused them discomfort or has hurt them but do not know that is not something unacceptable but a crime [15, 17]. They also tend to keep it a secret out of fear, guilt, and shame. When CSE occurs, the word of an infant turns against that of an adult, and when there is insufficient evidence, most are not reported [18].

CSE is evidenced by sexual activity between a child and an adult or another child who by age or development is in a relationship of responsibility, trust, or power, with the intention to gratify or satisfy the needs of the other person and the child is unable to give informed consent to, or is not developmentally prepared and cannot give consent, or that violates the laws or social taboos of society [19]; that is, the minor is forced to have sexual contact and/or any sexual conduct, such as watching and listening to pornography or displaying the genitals [20]; it is considered one of the most severe forms of violence and a serious violation of the rights of children and adolescents, with devastating consequences for the victims, their family, and the community [15].

If these traumatic events occur early in the vulnerable and critical developmental period before the age of five [21, 22], they interfere with normative development, generating sequelae that impact mental health and well-being, emerging during adulthood and persisting throughout life in different ways [2, 6–10, 23, 24].

Sequelae associated with CSA refer to emotional problems [9, 25–27]; borderline personality disorder [28, 29]; antisocial behavior problems, increasing the risk of criminal behavior [30–32]; post-traumatic stress disorder (PTSD) [33–35]; personality disorders in adult life [36–38]; and a clear association with suicidal ideation, self-injurious behavior and suicide attempt in adulthood [39–45].

2.1 Self-injurious behavior

Self-injurious behavior (SIB) is considered any deliberate self-directed behavior that causes immediate destruction of body tissues, such as cuts, burns, bumps, and abrasions. SIB is low-lethality and socially unacceptable, used as a coping mechanism for disturbing emotions, with the aim of replacing overwhelming emotional pain with manageable physical pain. Drug overdoses or poisonings with suicidal intent are excluded [46–51].

The age onset is different. Since self-harm with suicidal intent rarely occurs before the age of 15, non-suicidal SIB tends to start at younger ages [46, 52–54]. Although this behavior occurs mostly in adolescence, there is still a significant group of young adults who maintain the behavior [55].

At present, there is a debate about whether self-injurious behavior has the intention of death. According to the Statistical and Diagnostic Manual of Mental Disorders, Fifth Edition [56], self-harm is formally known as a nonsuicidal self-injury disorder (NSSID) as these self-destructive behaviors are carried out without any intention of suicide. Some researchers posit that SIB serves as a mechanism for self-relief and the release of tensions without the desire to die [57–59] Other surveyors emphasize the relationship between self-harm and suicide since data reveals that self-harm is the main risk factor for suicide attempts [60–62].

On this regard, in SIB with suicidal intent the individual seeks isolation, has little or no social interaction, and does not seek to belong or participate in a group; someone with non-suicidal SIB does seek to relate to others who understand and even share his or her feelings and behaviors and participating in groups that promote self-harm [63]. Two more aspects to consider are that SIB occurs more frequently in women than in men, with skin cuts being the most common method; and women also have a higher risk of suicide than men (3:1), associated with greater feelings of hopelessness and inability to resolve emotional problems [46, 64].

In a recent study, authors have tried to establish the differences between people who engage in NSSI and people who attempt suicide through algorithms, but the results were inconclusive to distinguish between groups with high accuracy [65]. So, more studies are needed particularly in psychological primitives—irreducible fundamental elements of the mind [66, 67]: internal stimuli, external stimuli, and conceptual knowledge, in this case, on emotions related to SIB and suicidal ideation [68].

2.2 Suicide

Far from being an isolated problem, suicide is also on the rise worldwide, with developing countries showing the highest rates (800,000 people per year) [69]. In Mexico (5.4 per 100,000 inhabitants) [70], and particularly in Nuevo Leon (in the first half of 2020, 152 suicides), suicide rates have been increasing [71].

It is important to consider two aspects that could lead people to act out their death wishes: the erroneous perception of burden that their existence harms and hinders others' lives, feeling emotionally and socially disconnected [44, 72–74], and an increase in suffering due to possible traumatic or painful events [75–77] that, for the sake of self-preservation, could live in a constant state of pain, either self-inflicted through self-injurious behaviors or mistreatment of others [74, 78, 79].

Likewise, it is important to keep in mind that people with a single suicide attempt are more likely than people with suicidal ideation to suffer from some type of disorder—depression, anxiety, post-traumatic stress, substance abuse—and usually were

exposed to some type of abuse, whether violent, psychological and/or sexual [80–82]. Similarly, people with multiple suicide attempts have a high rate of family suicide history [83, 84] and childhood emotional abuse, [76, 85, 86]; as well as psychopathological characteristics [87, 88], a higher degree of suicidal ideation [89, 90] and a higher proportion of psychiatric disorders [91, 92].

3. Understanding interaction of child abuse events and adult emerging syndromes in Mexico

To determine the relationship between traumatic events in childhood and the presence of emerging syndromes in adulthood in the Mexican population, quantitative, correlational-comparative research was carried out. Voluntarily, 670 people participated. The age range was between 18 and 77 (M = 28.15, SD = 12.34); 266 (39.7%) men, 399 (59.6%) women, 3 (0.4%) other, 2 (0.3%) did not respond; 258 (38.5%) self-injured.

The study was approved by the Ethical Committee of Psychology School of Universidad de Monterrey (Ref. 19112020-PSI-CI). Data were collected online through approximately 30-min computerized questionnaires using the Qualtrics platform. Only age and gender were considered inclusion criteria. Participants were provided with informed consent and completed a sociodemographic questionnaire and several clinical measures. All participants voluntarily agreed to take part in the study without incentives and were recruited through mailing lists and social networks.

We used some Psychology research measures including a sociodemographic section. We also used the rating scales described below.

Adverse experiences (AE). Based on the 12 dichotomic items of the adverse experiences that occurred before 18 years used in the National Comorbidity Scale-Replication (NCS-R) conducted by Green et al. [7], in this study we included: and then the groups of adverse experience. We included three interpersonal losses (parental death, parental divorce, and parental split-up); four types of family maladaptation (parental mental illness—major depression, generalized anxiety disorder, panic disorder, antisocial personality; parental substance use, parental criminality—robberies, arrests for criminal activity; and violence); three types of maltreatment (physical abuse; sexual abuse—erotic caress, rape intent, rape; and neglect); other children adversities (physical illness risking minor life; economic adversity to cover basic needs; and any adversity). Additionally, we asked for family stability through the number of split-ups (divorces or living with other people). We also asked separately for the biological death of the father and the mother. We also inquire for three different types of sexual abuse. The total number of items was 18.

PTSD Checklist for DSM-5. A 20-item self-report measure based on DSM-5 criteria for PTSD and was created to assess the presence and severity of post-traumatic stress symptoms (PTSD) that cannot be explained or attributed to other conditions, e.g., substance abuse, medical conditions, bereavement, among others [93]. We used the Mexican Spanish adaptation with a satisfactory consistency ($\alpha = .943$) [94]. The items are rated on a Likert-type scale ranging from zero (not at all) to four (totally) and assess symptoms of re-experiencing (e.g., unwanted, and disturbing recurring memories of the stressful experience; $\alpha = .861$); avoidance (e.g., avoiding memories, thoughts, or feelings related to the stressful experience; arousal (e.g., irritable behavior, angry outbursts, or acting aggressively); and cognitive disturbances (e.g., having difficulty concentrating). The severity index ranges from 0 to 80.

Inventory of Statements About Self-Injury (ISAS). The scale is divided into two sections: the first one assesses lifetime frequency of 12 non-suicidal self-injury (NSSI) behaviors performed "intentionally (i.e., on purpose) and without suicidal intent." The behaviors assessed are banging/hitting self, biting, burning, carving, cutting, wound picking, needle-sticking, pinching, hair pulling, rubbing skin against rough surfaces, severe scratching, and swallowing chemicals. Participants are asked to estimate the number of times they have performed each behavior. Five additional questions assess descriptive and contextual factors, including age of onset, the experience of pain during NSSI, whether NSSI is performed alone or around others, and time between the urge to self-injure and the act [95]. In addition, some ad-hoc questions are added, such as the number of self-harms in the last year [96, 97]. We used the Mexican Spanish validated version [98]. The second section is 39 items of self-report grouped into two factors: interpersonal (e.g., reassuring myself) and intrapersonal (e.g., demonstrating that I do not need the help of others), both with adequate internal consistency ($\alpha = 0.88$ and $\alpha = 0.80$, respectively), with three possible Likert-type response categories: zero (not at all relevant), one (somewhat relevant) and two (very relevant). Functions associated with these two NSSI factors include affect regulation, self-punishment, anti-dissociation/feeling generation, anti-suicide, and marking distress in Intrapersonal, while interpersonal boundaries, self-care, sensation seeking, peer bonding, interpersonal influence, toughness, revenge, and autonomy constitute Interpersonal.

Acquired Capability with Rehearsal for Suicide Scale (ACWRSS). A seven-item self-report was developed to capture the key facets of acquired capability for suicide [99]. Items are rated from zero (not at all) to eight (very strongly); higher scores demonstrate an increased risk of suicide [100]. The scale assesses reduced fear associated with death (e.g., Imagining my own death is very scary), increased pain tolerance (e.g., I can tolerate pain much more than I used to), and mental rehearsal of suicide (e.g., It has crossed my mind what it would be like to die). It correlates significantly with previous suicide attempts and nonsuicidal self-harm thoughts and episodes and has excellent non-clinical internal consistency ($\alpha = 0.91$).

Using the statistical package for Social Sciences (SPSS 28v), we first checked if the assumptions were met for all parametric tests conducted. Additionally, descriptive analyzes were carried out to present frequencies and percentages of adverse events in childhood (ACE). We then carried out the reliability analyses of the instruments. In addition, we performed multiple correlation analyses (Pearson's r). We then decided to conduct an exploratory factor analysis of the Adverse Events in Childhood, specifically looking for sexual abuse to carry out predictive and explanatory models based on the interaction of the variables in the study.

3.1 What we found

We initially found that 299 (44.6%) did not experience any traumatic events, but 371 (55.4%) experienced one (109, 16.3%) to 18 (.1%), and of those, 350 (94.3%) participants experience from one to seven adverse events; and 112 (16.7%) more than four adverse childhood event (ACE). In **Table 1,** we present the frequencies and percentages of the adverse events in childhood reported by the participants ($M = 1.71$, $SD = 2.37$). Family instability and biological father death were the most common reported adverse childhood events.

Relationships between variables are shown in **Table 2**. Correlations between variables have shown theoretically expected directions. For instance, Total Adverse

Adverse events in childhood	Frequency	Percentage
IL: Biological father death	104	15.5
IL: Biological mother death	43	6.4
IL: Divorce biological parents	90	13.4
IL: Biological parents' split-up	81	12.1
PM: Mental illness—depression	67	10.0
PM: Mental illness—anxiety	52	7.8
PM: Mental illness—panic attacks	16	2.4
PM: Mental illness—antisocial	16	2.4
PM: Mental illness—bipolar	22	2.2
PM: Mental illness—psychosis	6	0.9
PM: Parental substance abuse	74	11.0
PM: Parental criminality	8	1.2
PM: Violence between parents	94	14.0
M: Physical abuse	48	7.2
M: Sexual abuse—caress	71	10.6
M: Sexual abuse—rape intent	29	4.3
M: Sexual abuse—rape	24	3.6
M: Neglect	32	4.8
Life-threatening respondent childhood physical illness	48	7.2
Extreme childhood family economic adversity	58	8.7
Family instability	110	16.4
Separations (e.g., sending to live with other people/relatives)	55	8.2

Notes: IL = interpersonal loss, PM = parental maladjustment, M = maltreatment.
N = 670.

Table 1.
Frequency of adverse events in childhood.

Events correlated positively with all emerging psychopathological syndromes in adulthood. The correlations with ACE from highest to lowest association are PTSD, NSSI Intrapersonal, Preparedness to Suicide, and NSSI Interpersonal. Regarding Preparedness to Suicide, NSSI Intrapersonal is followed by PTSD and NSSI Interpersonal.

Then, we decided to work with the ACE and carried out an exploratory factor analysis (EFA) to group the adverse events once the number of times they occurred was recorded. A six-factor model was driven. First, the Kaiser-Meyer-Olkin sample adequacy index (KMO = 0.834) and Bartlett's sphericity test were calculated, which were statistically significant [$\chi^2(231) = 4018.09, p < .001$], indicating the feasibility of performing a factorial analysis. Next, a maximum likelihood analysis with Varimax rotation was performed specifying six factors. Finally, an exploratory factor analysis was performed using the rotated components method given the six-dimensional structure initially considered, which explained 55.76% of the variance, with a large effect size ($\eta^2 = 78.9\%$). The Cronbach's alpha indicated good internal reliability for

Variables	Mean	SD	1	2	3	4
1. Total Adverse Events	1.71	2.37	—			
2. Post-traumatic stress	1.99	0.81	.311**	—		
3. Preparedness for suicide	2.37	2.48	.148**	.389**	—	
4. NSSI interpersonal	0.22	0.35	.083*	.267**	.187**	—
5. NSSI intrapersonal	0.30	0.40	.177**	.425**	.424**	.756**

Note: NSSI = Nonsuicidal Self-Injury
**The correlation is significant at the 0.05 level (bilateral).*
***The correlation is significant at the 0.01 level (bilateral).*

Table 2.
Means, standard deviations, and correlations between variables in the study.

the total scale (α = .829) and each factor: 1 Parents' Mental Health (α = .669); 2 Sexual Abuse (α = .633); 3 Family Violence (α = .650); 4, Family instability (α = .666); 5 Absent Parents (α = .639); and 6 Adversity (α = .615).

As we were particularly interested in sexual abuse implications in adulthood, we used this discriminative factor to determine those participants that experienced sexual abuse in childhood and found 124 (18.5%). Afterward, we conducted a multiple linear regression to determine the predicted value of the variables of sexual abuse, NSSI Interpersonal and Intrapersonal, on Preparedness for Suicide. The results indicated that NSSI and TEPT explained 26.4% of Preparedness for Suicide (**Table 3**).

Based on the results, as sexual abuse practically disappeared in the regression model, we decided to carry out two sequential mediation analyses to examine the interaction of variables using the computational tool macro-PROCESS (model 4, bootstrapping 10,000 samples, 95% CI) statistical program for Social Sciences (SPSS) [101]. For these analytic approaches, initially Sexual Abuse in Childhood was considered as the predictor variable (*X*), with Preparedness for Suicide as the output variable (*Y*), Post-traumatic Stress (*M1*) as the first mediating variable, and NSSI Interpersonal (*M2*) as the sequential mediating variable. The interaction of PTSD and NSSI Interpersonal on the direct effect of Sexual Abuse in Childhood on Preparedness for Suicide (completely standardized indirect effect [0.02, SE 0.007, 95% CI (.011; .037)] (**Figure 1**).

Afterward, a second mediation analysis was carried out considering Sexual Abuse as the predictor variable (*X*) with Preparedness for Suicide as the output variable (*Y*) testing again the same mediators: PTSD (*M1*) as the first mediating variable and NSSI Intrapersonal (*M2*) as the sequential mediating variable. The interaction of PTSD and NSSI Interpersonal on the direct effect of ACE Sexual Abuse on Preparedness

$F_{(4,665)} = 60.892, p < .001, R^2_a = 0.264$				
Predictor variables	**β**	***t***	***p***	**95% *CI***
Sexual Abuse in Childhood	.030	.892	.373	[−.089; .238]
NSSI Interpersonal	−.284	−5.572	<.001	[−2.726; −1.305]
NSSI Intrapersonal	.538	9.919	<.001	[2.685; 4.010]
Post-traumatic Stress	.231	6.218	<.001	[.485; .933]

Table 3.
Predictive regression model for Preparedness for Suicide of participants (n = 670).

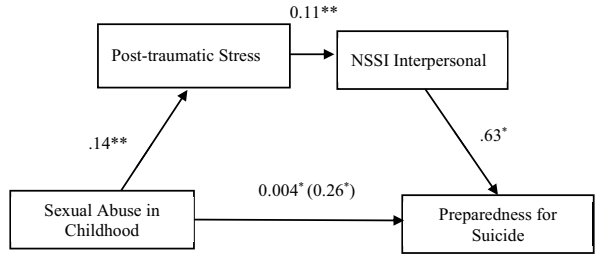


Figure 1.
*Sequential mediation analysis of Post-traumatic Stress (serial mediator 1) and NSSI Interpersonal (serial mediator 2) in the relation between Sexual Abuse in Childhood and Preparedness for Suicide. Direct effects after including the mediator are in brackets. ** p ≤ 0.001; * p ≤ 0.05.*

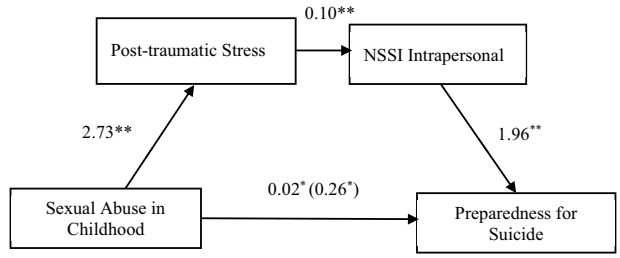


Figure 2.
*Sequential mediation analysis of Post-traumatic Stress (serial mediator 1) and NSSI Intrapersonal (serial mediator 2) in the relation between Sexual Abuse in Childhood and Preparedness for Suicide. Direct effects after including the mediator are in brackets. ** p ≤ 0.001; * p ≤ 0.05.*

for Suicide predicts a strong indirect effect (completely standardized indirect effect [0.02, SE 0.007, 95% CI (.011; .037)] (**Figure 2**).

4. Conclusions

Several important findings arose from our study. Considering that we were looking for emerging psychopathological syndromes in adulthood, particularly post-traumatic stress disorder, self-injurious behavior, and suicide risk when people are exposed to adverse events in childhood, particularly sexual abuse.

In this general population research, we found that 55.4% had at least one adverse childhood experience (ACE) and 94.3% of participants experienced from 1 to 7 adverse events, and 16.7% suffered more than 4 ACE. This data is close to 61% with at least one ACE and 16% that had four or more types (one in six adults) [102] so preventing early trauma is imperative.

In this Mexican sample, family instability (110, 16.4%) and biological father death (104, 15.5%) were the most common reported ACE, both having enduring health consequences across the life span. Family instability captures changes in family structure [103] and father's death—5% [104] in the UK, 4.5% [105, 106] in Denmark—diminishes personal mastery such as vision, purpose, commitment, belief, and self-knowledge—[107]. Additionally, losing at least one parent by the age of 15, 21.9% in our study is close to the 20% reported in China, Italy, and the Netherlands [108, 109]

associated with serious consequences in adjustment, particularly in behavioral problems, and negative implications in cognitive and educational outcomes [106, 107].

As the association of sexual abuse is often found related to self-injurious and suicidal behavior, we conducted a linear multiple regression model and found NSSI Interpersonal and Intrapersonal predict them [110]. NSSI Interpersonal is negatively predicting preparedness for suicide which could be explained due to the social functions of this outward expression of distress and emotional pain that provides others' support, help-seeking and caring response, and fitness; generate excitement; and stop both, suicidal thoughts and feeling numb [111–114]. NSSI Intrapersonal positively predicted preparedness for suicide. This has also been reported in several studies related to future repetition of self-harm and prospective risk for suicide attempts [110–112, 115, 116]. This happens because sexual abuse is a form of child maltreatment strongly associated with suicidality [117, 118]. PTSD also predicted preparedness for suicide-related to different ACE, particularly sexual abuse [119–122].

In relation to the current debate about self-harm, these findings allow us to consider that effectively NSSI Interpersonal may be a deliberate way of harming oneself without the desire to die [57–59]; however, the NSSI Intrapersonal significantly predicts preparation for suicide, which indicates that this factor of self-injurious behavior is associated not only with suicidal thoughts [55, 123–126], but also to preparedness and attempt, possibly as the only way for definitive relief of pain, fear [61, 109, 127, 128], and suffering due to traumatic events [74–76].

Finally, the two sequential mediational models indicate that nonetheless, sexual abuse in childhood has a direct effect on preparedness for suicide, it also has a domino effect, that is, a series of related events, one following another. ACE sexual abuse predicts PTSD, but when this variable interacts with NSSI Interpersonal which provides significant emotional relief and generates feeling motives [129, 130], in turn, has a complete mediation effect in preparedness for suicide. When PTSD interacts with NSSI Intrapersonal, even though strongly predicts suicide [57, 125, 130], the interaction has a partial mediation effect on preparedness for suicide diminishing it considerably.

These findings indicate that the long-term negative effects of childhood traumatic events emerge as syndromes in adulthood: post-traumatic stress disorder, self-injurious behaviors, and suicidal behavior. Also, the interaction of PTSD with non-suicidal intrapersonal and interpersonal self-harm prevents the individual from being directly involved in preparing for suicide. Experiencing ACE, especially sexual abuse, has a traumatic impact, frequently developing PTSD which symptoms can make a person feel constantly afraid, isolated, with no hope or escape, which in turn can lead the person to self-injurious behavior.

Our outcomes indicate that the interaction of PTSD symptomatology predicts nonsuicidal self-injury, both NSSI interpersonal and intrapersonal, which, despite having different functions, mediate the direct effect of child sexual abuse on the preparation for suicide. So, coping with outward expression of distress and emotional pain to reduce tensions (interpersonal) or self-punishment (intrapersonal), prevent suicidality.

Some limitations to consider are the reliability of the retrospective assessment of childhood trauma experiences assessed in adulthood, may be influenced by uncontrolled recall bias. Despite our data was collected in a large and representative sample of nonclinical population, the results are not generalizable, but they are a good approach to what is happening in Mexican adults who had child sexual abuse.

All these findings have implications for clinical and social practice. It is important that when a person who suffered child sexual abuse seeks psychological care, it is necessary to assess the possible symptomatology of post-traumatic stress, and, where appropriate, the reasons and all functions that lead the person to self-harm, examining the presence of suicidal ideation, preparedness, or attempts, as well. This will allow to design therapeutic focused intervention to prevent suicide risk and NSSI cessation, to develop emotion regulation and interpersonal communication skills to provide hope in achieving a life free of psychic pain.

Future research is needed, including qualitative studies, to continue examining the adaptive functions of NSSI behavior interacting with PTSD to cope with suicidal thoughts and attempts, as well as exploring protective factors such as hope, social support, parenting styles and family dynamics.

Additionally, we need to enforce continuous efforts with families, implementing programs, activities, and procedures designed to carry out preventive measures particularly for sexual abuse that causes intentional harm and suffering to the children, whose consequences persist as emergent syndromes in adulthood.

Conflict of interest

The authors declare no conflict of interest.

Author details

Angélica Quiroga-Garza[1*] and María José Almela-Ojeda[1,2]

1 Universidad de Monterrey, Garza García, Mexico

2 Universidad de Monterrey, Garza García, Fundación El Roble, Monterrey, Mexico

*Address all correspondence to: angelica.quiroga@udem.edu

IntechOpen

References

[1] Kessler RC, Üstün TB. The WHO World Mental Health Surveys: Global Perspectives on the Epidemiology of Mental Disorders. Cambridge University Press; 2008

[2] Bind R, Trinetti J, Sawyer K, Pariante CM. Perinatal mental health and childhood trauma. In: Spalletta GD, Piras FJ, Sani G, editors. Childhood Trauma in Mental Disorders. Springer; 2020. pp. 63-77

[3] Waikamp V, Barcellos F. Repercussions of trauma in childhood in the psychopathology of adult life. Ciencias Psicológicas. 2018;**12**(1):137-144

[4] Hornor G. Resilience in children recovering from trauma. In: Nabors L, editor. Resilient Children. Springer; 2021. pp. 22-46

[5] Jimeno M. Traumatic experiences in childhood and their influence on affective-social development and autobiographical memory in institutionalized adolescents: Comparison with a control group (Doctor). Universidad de Castilla-La Mancha; 2015

[6] Bloomfield MAP. Trauma and post-traumatic stress disorder: Children should be seen and heard. The Lancet Psychiatry. 2019;**6**:193-194

[7] Green JG, McLaughlin KA, Berglund PA, Gruber MJ, Sampson NA, Zaslavsky AM, et al. Childhood adversities and adult psychiatric disorders in the national comorbidity survey replication I: Associations with first onset of DSM-IV disorders. Archives of General Psychiatry. 2010;**67**(2):113-123

[8] Kessler RC, McLaughlin KA, Green JG, Gruber MJ, Sampson NA, Zaslavsky AM, et al. Childhood adversities and adult psychopathology in the WHO world mental health surveys. The British Journal of Psychiatry. 2010;**197**(5):378-385

[9] Norman RE, Byambaa M, De R, Butchart A, Scott J, Vos T. The long-term health consequences of child physical abuse, emotional abuse, and neglect: A systematic review and meta-analysis. PLoS Medicine. 2012;**9**(11):e1001349

[10] Shonkoff JP, Garner AS, Siegel BS, Dobbins MI, Earls MF, McGuinn L, et al. The lifelong effects of early childhood adversity and toxic stress. Pediatrics. 2012;**129**(1):e232-e246. DOI: 10.1542/peds.2011-2663

[11] OECD. Changing the Odds for Vulnerable Children: Building Opportunities and Resilience. Paris: OECD Publishing; 2019

[12] Valdez-Santiago R, Villalobos A, Arenas-Monreal L, Flores-Celis K, Ramos-Lira L. Child sexual abuse in Mexico: Risk behaviors and mental health indicators in adolescents. Salud Pública de México. 2020;**62**(6):661-671

[13] Darkness to Light. Prevalence of child sexual abuse. Prevention. 2022. https://www.d2l.org/child-sexual-abuse/prevalence/

[14] Varas A. Child sexual violence in Mexico. El Financiero. 2021

[15] Executive Commission for Attention to Victims. Bill of rights of victims of child sexual violence [Pamphlet]. Instituto Mexicano del Seguro Social; 2016

[16] Gasca A. Why do victims not report to the authorities? Animal Político.

2021. Animal Político is a ONG and the information is published in the internet site: https://www.animalpolitico.com/seguridad-justicia-y-paz/por-que-las-personas-victimas-no-denuncian-ante-la-autoridad/

[17] Niño de Rivera S, Castañeda M, Llamas M, González A, Vallarino J, Balandra J, et al. No is No. Guide to Action against Sexual Violence in Mexico: Know, Act, Denounce and Accompany. Penguin Random House; 2021. ISBN: 978-607-38-0407-3

[18] Domínguez I, Núñez J. Reporting child abuse, a judicial ordeal. El País. 2021

[19] World Health Organization. Guidelines for Medico-legal Care of Victims of Sexual Violence. Geneva: World Health Organization; 2003. pp. 75-93

[20] DIF National System. Do you know what sexual abuse of girls and boys is? 2017

[21] Matrángolo G, Yaccarini C, Paz G. Self-esteem, personality, spirituality and centrality of traumatic events linked to psychosocial problems in childhood. Revista Científica Arbitrada de la Fundación Mente Clara. 2017;**2**(2):217-237

[22] Everstine DS, Everstine L. Sexual Trauma in Children and Adolescents: Dynamics & Treatment. Routledge; 2019

[23] Vega M, Nuñez U. Adverse childhood experiences: Review of its impact on children from 0 to 5 years old. Enfermería Universitaria. 2017;**14**(2):124-130

[24] Organización Mundial de la Salud. Prevención del maltrato infantil: qué hacer, y cómo obtener evidencias. Ginebra; 2019. Available from: https://apps.who.int/iris/handle/10665/44228

[25] Cukor D, McGinn LK. History of child abuse and severity of adult depression: The mediating role of cognitive schema. Journal of Child Sexual Abuse. 2006;**15**(3):19-34

[26] Echeburúa E, de Corral P. Secuelas emocionales en víctimas de abuso sexual en la infancia. Cuadernos de Medicina Forense. 2006;**43-44**:75-82

[27] Pereda N. Consecuencias psicológicas a largo plazo del abuso sexual infantil - Dialnet. Papeles del psicólogo. 2010;**31**(2):191-201

[28] Menon P, Chaudhari B, Saldanha D, Devabhaktuni S, Bhattacharya L. Childhood sexual abuse in adult patients with borderline personality disorder. Industrial Psychiatry Journal. 2016;**25**(1):101

[29] Temes CM, Magni LR, Aguirre BA, Goodman M, Ridolfi ME, Zanarini MC. Parameters of reported childhood sexual abuse and assault in adolescents and adults with borderline personality disorder. Personality and Mental Health. 2020;**14**(3):254-262

[30] Cubellis MA, Peterson BE, Henninger AM, Lee D. Childhood sexual abuse and antisocial traits and behaviors: A gendered examination of the factors associated with perpetration of intimate partner violence. Journal of Interpersonal Violence. 2018;**33**(20):3125-3161

[31] Dargis M, Newman J, Koenigs M. Clarifying the link between childhood abuse history and psychopathic traits in adult criminal offenders. Personality Disorders, Theory, Research, and Treatment. 2016;7(3):221-228

[32] DeLisi M, Drury AJ, Elbert MJ. The etiology of antisocial personality disorder: The differential roles of adverse childhood experiences and childhood psychopathology. Comprehensive Psychiatry. 2019;**92**:1-6

[33] Darves-Bornoz JM, Lépine JP, Choquet M, Berger C, Degiovanni A, Gaillard P. Predictive factors of chronic post-traumatic stress disorder in rape victims. European Psychiatry. 1998;**13**(6):281-287

[34] Maikovich AK, Koenen KC, Jaffee SR. Posttraumatic stress symptoms and trajectories in child sexual abuse victims: An analysis of sex differences using the national survey of child and adolescent well-being. Journal of Abnormal Child Psychology. 2009;**37**(5):727-737

[35] Nooner KB, Linares LO, Batinjane J, Kramer RA, Silva R, Cloitre M. Factors related to posttraumatic stress disorder in adolescence. Trauma, Violence & Abuse. 2012;**13**(3):153-166

[36] Fleming J, Mullen PE, Sibthorpe B, Bammer G. The long-term impact of childhood sexual abuse in Australian women. Child Abuse & Neglect. 1999;**23**(2):145-159

[37] Peleikis DE, Mykletun A, Dahl AA. Current mental health in women with childhood sexual abuse who had outpatient psychotherapy. European Psychiatry. 2005;**20**(3):260-267

[38] Vitriol V. Relación entre psicopatología adulta y antecedentes de trauma infantil. Revista Chilena de Neuro-Psiquiatría. 2005;**43**(2):88-96

[39] Andover MS, Zlotnick C, Miller IW. Childhood physical and sexual abuse in depressed patients with single and multiple suicide attempts. Suicide & Life-Threatening Behavior. 2007;**37**(4):467-474

[40] Angelakis I, Austin JL, Gooding P. Association of childhood maltreatment with suicide behaviors among young people: A systematic review and meta-analysis. JAMA Network Open. 2020;**3**(8):e2012563

[41] Cantón-Cortés D, Cortés MR, Cantón J. Child sexual abuse and suicidal ideation: The differential role of attachment and emotional security in the family system. International Journal of Environmental Research and Public Health. 2020;**17**(9):e3163

[42] Cortés-Arboleda MR, Cantón-Cortés D, Cantón-Duarte J. Consecuencias a largo plazo del abuso sexual infantil: papel de la naturaleza y continuidad del abuso y del ambiente familiar. Psicología Conductual. 2011;**19**(1):41-56

[43] Gong M, Zhang S, Li W, Wang W, Wu R, Guo L, et al. Association between childhood maltreatment and suicidal ideation and suicide attempts among Chinese adolescents: The moderating role of depressive symptoms. International Journal of Environmental Research and Public Health. 2020;**17**:1-14

[44] Joiner TE, Sachs-Ericsson NJ, Wingate LRR, Brown JS, Anestis MD, Selby EA. Childhood physical and sexual abuse and lifetime number of suicide attempts: A persistent and theoretically important relationship. Behaviour Research and Therapy. 2007;**45**(3):539-547

[45] Ystgaard M, Hestetun I, Loeb M, Mehlum L. Is there a specific relationship between childhood sexual and physical abuse and repeated suicidal behavior? 2004

[46] Buresová I. Self-harm in Adolescence. Frankfurt: Peter Lang Academic Research; 2016

[47] Mollà L, Vila SB, Treen D, López J, Sanz N, Martín LM, et al. Nonsuicidal self-harm in adolescents: Review of psychological treatments. Revista de Psicopatología y Psicología Clínica. 2015;**20**(201):51-61

[48] Walker S. Responding to Self-harm in Children and Adolescents: A Professional's Guide to Identification, Intervention and Support. Londres: Jessica Kingsley Publishers; 2012

[49] Martin MS, Dykxhoorn J, Afifi TO, Colman I. Child abuse and the prevalence of suicide attempts among those reporting suicide ideation. Social Psychiatry and Psychiatric Epidemiology. 2016;**51**(11):1477-1484

[50] Posner K, Brodsky B, Yershova K, Buchanan J, Mann J. The Oxford Handbook of Suicide and Self-injury. New York: Oxford University Press; 2014. pp. 7-20

[51] Xavier A, Cunha M, Gouveia JP. Deliberate self-harm in adolescence: The impact of childhood experiences, negative affect and fears of compassion. Revista de Psicopatologia y Psicologia Clinica. 2015;**20**(1):41-49

[52] Balbi E, Boggiani E, Dolci M. Violent Adolescents: With Others, with Themselves. Herder; 2012

[53] Cruz D, Narciso I, Muñoz M, Pereira CR, Sampaio D. Adolescents and self-destructie behavior: An exploratory analysis of family and individual correlates. Behavioral Psychology/Psicología Conductual. 2013;**21**(2):271-288

[54] Martin J, Bureau J, Yurkowski K, Lafontaine M, Cloutier P. Heterogeneity of relational background is associated with variation in non-suicidal self-injurious behavior. Journal of Abnormal Child Psychology. 2016;**44**:511-522

[55] Benjet C, González-Herrera I, Castro-Silva E, Méndez E, Borges G, Casanova L, et al. Non-suicidal self-injury in Mexican young adults: Prevalence, associations with suicidal behavior and psychiatric disorders, and DSM-5 proposed diagnostic criteria. Journal of Affective Disorders. 2017;**215**:1-8

[56] American Psychiatric Association. DSM-5. Manual Diagnóstico y Estadístico de los Trastornos Mentales DSM-5® | Acceso a material complementario. 5th ed. APA; 2014

[57] Anestis MD, Knorr AC, Tull MT, Lavender JM, Gratz KL. The importance of high distress tolerance in the relationship between nonsuicidal self-injury and suicide potential. Suicide & Life-Threatening Behavior. 2013;**43**(6):663-675

[58] Klonsky ED. The functions of deliberate self-injury: A review of the evidence. Clinical Psychology Review. 2007;**27**(2):226-239

[59] Flores-Soto M, del Flores-Soto M, Cancino-Marentes ME, del Varela Ma RF. Systematic review of self-injurious behaviors without suicidal intention in adolescents. Revista Cubana de Salud Pública. 2018;**44**(4):e1113

[60] David Klonsky E, May AM, Glenn CR. The relationship between nonsuicidal self-injury and attempted suicide: Converging evidence from four samples. Journal of Abnormal Psychology. 2013;**122**(1):231-237

[61] Nock MK, Joiner TE, Gordon KH, Lloyd-Richardson E,

Prinstein MJ. Non-suicidal self-injury among adolescents: Diagnostic correlates and relation to suicide attempts. Psychiatry Research. 2006;**144**(1):65-72

[62] Vega D, Sintes A, Fernández M, Punti J, Soler J, Santamarina P, et al. Review and update on non-suicidal self-injury: Who, how and why? Actas Españolas de Psiquiatría. 2018;**46**(4):146-155

[63] Cut OF. Self-harm and Suicide Attempts in Childhood and Adolescence. Buenos Aires, AR: Urano; 2014

[64] di Rico E, Paternain N, Portillo N, Galarza A. Analysis of the relationship between interpersonal factors and suicidal risk in adolescents from the city of Necochea. Perspectivas en Psicología. 2016;**13**:95-106

[65] Huang X, Ribeiro JD, Franklin JC. The differences between individuals engaging in nonsuicidal Self-Injury and suicide attempt are complex (vs. complicated or simple). Frontiers in Psychiatry. 2020;**11**:239

[66] Barrett LF. Solving the emotion paradox: Categorization and the experience of emotion. Personality and Social Psychology Review. 2006;**10**(1):20-46

[67] Barrett LF. Variety is the spice of life: A psychological construction approach to understanding variability in emotion. Cognition & Emotion. 2009;**23**(7):1284-1306

[68] Barrett LF. The theory of constructed emotion: An active inference account of interception and categorization. Social Cognitive and Affective Neuroscience. 2017;**2**:1-23

[69] World Health Organization. Preventing Suicide: A Global Imperative. HV; 2014. p. 6545

[70] Instituto Nacional de Estadística y Geografía (INEGI). Statistics on the World Day for Suicide Prevention (September 10). 2021. Report No.: 455/19

[71] Government of the State of Nuevo Leon. Suicide report first semester of the year 2021. Nuevo Leon. 2021

[72] Joiner TE, Pettit JW, Walker RL, Voelz ZR, Cruz J, Rudd MD, et al. Perceived burdensomeness and suicidality: Two studies on the suicide notes of those attempting and those completing suicide. Journal of Social and Clinical Psychology. 2002;**21**(5):531-545

[73] Van Orden KA, Lynam ME, Hollar D, Joiner TE. Perceived burdensomeness as an indicator of suicidal symptoms. Cognitive Therapy and Research. 2006;**30**(4):457-467

[74] Joiner TE, Van Orden KA, Witte TK, Selby EA, Ribeiro JD, Lewis R, et al. Main predictions of the interpersonal-psychological theory of suicidal behavior: Empirical tests in two samples of young adults. Journal of Abnormal Psychology. 2009;**118**(3):634-646

[75] Galindo GC, Bahamón MJM. Cognitive Theory and Psychological Interpersonal Theory of Suicidal Behavior in Emerging Debates in Psychology. Bogotá, CO: UNAD; 2017

[76] Borges G, Benjet C, Orozco R, Medina-Mora ME, Mendez E, Molnar BE. Traumatic life-events and suicidality among Mexican adolescents as they grow up: A longitudinal community survey. Journal of Psychiatric Research. 2021;**142**:171-178

[77] Zatti C, Rosa V, Barros A, Valdivia L, Calegaro VC, Freitas LH, et al. Childhood trauma and suicide attempt: A meta-analysis of longitudinal studies from

the last decade. Psychiatry Research. 2017;**256**:353-358

[78] Harriss L, Hawton K. Suicidal intent in deliberate self-harm and the risk of suicide: The predictive power of the Suicide Intent Scale. Journal of Affective Disorders. 2005;**86**(2-3):225-233

[79] Hawton K, Clements A, Sakarovitch C, Simkin S, Deeks JJ. Suicide in doctors: A study of risk according to gender, seniority and specialty in medical practitioners in England and Wales, 1979-1995. Journal of Epidemiology and Community Health. 2001;**55**(5): 296-300

[80] Millner AJ, Ursano RJ, Hwang I. J. King A, Naifeh JA, Sampson NA, et al. Prior mental disorders and lifetime suicidal behaviors among US army soldiers in the army study to assess risk and resilience in servicemembers (Army STARRS). Suicide & Life-Threatening Behavior. 2019;**49**(1):3-22

[81] Yates A, Cohan A, Goharian N. Depression and self-harm risk assessment in online forums. In: EMNLP 2017 - Conference on Empirical Methods in Natural Language Processing, Proceedings. 2017. pp. 2968-2978

[82] Rossi R, Talevi D, Gregori E, Quarta E, Lucaselli A, Pacitti F. Early interpersonal violence mediates the effect of family history of mental disorder on suicide attempts in a non-clinical sample. Rivista di Psichiatria. 2020;**55**(1):37-40

[83] Rajalin M, Hirvikoski T, Salander Renberg E, Åsberg M, Jokinen J. Family history of suicide and interpersonal functioning in suicide attempters. Psychiatry Research. 2017;**247**:310-314

[84] O'Reilly LM, Kuja-Halkola R, Rickert ME, Class QA, Larsson H, Lichtenstein P, et al. The intergenerational transmission of suicidal behavior: An offspring of siblings study. Translational Psychiatry. 2020;**10**:1-11

[85] David Klonsky E, May AM. The three-step theory (3ST): A new theory of suicide rooted in the "ideation-to-action" framework. International Journal of Cognitive Therapy. 2015;**8**:114-129

[86] Miller AB, Jenness JL, Oppenheimer CW, Gottleib ALB, Young JF, Hankin BL. Childhood emotional maltreatment as a robust predictor of suicidal ideation: A multi-wave, prospective investigation. Journal of Abnormal Child Psychology. 2017;**45**:116

[87] Janiri D, de Rossi P, Kotzalidis GD, Girardi P, Koukopoulos AE, Reginaldi D, et al. Psychopathological characteristics and adverse childhood events are differentially associated with suicidal ideation and suicidal acts in mood disorders. European Psychiatry. 2018;**53**:31-36

[88] Janiri D, Moccia L, Conte E, Palumbo L, Chieffo DPR, Fredda G, et al. Emotional dysregulation, temperament and lifetime suicidal ideation among youths with mood disorders. Journal of Persian Medicine. 2021;**11**(9):31-36

[89] Bryan CJ, Bryan ABO, Ray-Sannerud BN, Etienne N, Morrow CE. Suicide attempts before joining the military increase risk for suicide attempts and severity of suicidal ideation among military personnel and veterans. Comprehensive Psychiatry. 2014;**55**(3):534-541

[90] Harmer B, Lee S, Duong T, Saadabadi A. Suicidal Ideation. StatPearls Publishing; 2021

[91] Park CHK, Lee JW, Lee SY, Moon J, Jeon DW, Shim SH, et al. Suicide risk factors across suicidal ideators, single suicide attempters, and multiple suicide attempters. Journal of Psychiatric Research. 2020;**131**:1-8

[92] Song Y, Rhee SJ, Lee H, Kim MJ, Shin D, Ahn YM, et al. Comparison of suicide risk by mental illness: A retrospective review of 14-year electronic medical records. Journal of Korean Medical Science. 2020;**35**:e402

[93] Weathers FW, Litz B, Herman D, Huska J, Keane T. The Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5): Development and Initial Psychometric Evaluation. Paper presented at the Annual Meeting of the International Society for Traumatic Stress Studies. San Antonio, TX; 1993

[94] Durón-Figueroa R, Cárdenas-López G, Castro-Calvo J, de la Rosa-Gómez A. Adaptación de la Lista Checable de Trastorno por Estrés Postraumático para DSM-5 en Población Mexicana. Acta de Investigación Psicológica. 2019;**9**(1):26-36

[95] Klonsky ED, Glenn CR. Assessing the functions of non-suicidal self-injury: Psychometric properties of the inventory of statements about self-injury (ISAS). Journal of Psychopathology and Behavioral Assessment. 2009;**31**(3):215-219

[96] Perez Prada M, Viancha Pinzon M, Martinez Baquero L, Salas BI. El maltrato familiar y su relación con la ideación suicida en adolescentes escolarizados de instituciones públicas y privadas de las ciudades de Tunja. Duitama y Sogamoso. Psicogente. 2014;**17**(31):80-92

[97] Plener PL, Allroggen M, Kapusta ND, Brähler E, Fegert JM, Groschwitz RC. The prevalence of Nonsuicidal Self-Injury (NSSI) in a representative sample of the German population. BMC Psychiatry. 2016;**16**(1):e353

[98] Castro E, Benjet C, Juárez F, Jurado S, Lucio ME, Valencia A. Adaptation and psychometric properties of the Inventory of Statements About Self-injury in Mexican students. Acta de Investigación Psicológica. 2016;**6**(3):2544-2551

[99] George SE, Page AC, Hooke GR, Stritzke WGK. Multifacet assessment of capability for suicide: Development and prospective validation of the acquired capability with rehearsal for suicide scale. Psychological Assessment. 2016;**28**(11):1452-1464

[100] Schneider M. The Influence of Disturbing Dreams on One's Acquired Capability for Suicide. Florida State University; 2019 ProQuest: 13857370

[101] Vitalsigns CDC. Adverse Childhood Experiences (ACEs). Preventing Early Trauma to Improve Adult Health. Bulletin: Vital Signs. 2019. pp. 2

[102] Gaydosh L, Harris KM. Childhood family instability and young adult health. Journal of Health and Social Behavior. 2018;**59**(3):390

[103] Ellis J, Dowrick C, Lloyd-Williams M. The long-term impact of early parental death: Lessons from a narrative study. Journal of the Royal Society of Medicine. 2013;**106**(2):57-67

[104] Høeg BL, Johansen C, Christensen J, Frederiksen K, Dalton SO, Dyregrov A, et al. Early parental loss and intimate relationships in adulthood: A nationwide study. Developmental Psychology. 2018;**54**(5):963-974

[105] Høeg BL, Johansen C, Christensen J, Frederiksen K, Dalton SO, Bøge P, et al.

Does losing a parent early influence the education you obtain? A nationwide cohort study in Denmark. Journal of Public Health (Oxford, England). 2019;**41**(2):296-304

[106] Hayslip B, Pruett JH, Caballero DM. The "how" and "when" of parental loss in adulthood: Effects on grief and adjustment. Omega (United States). 2015;**71**(1):3-18

[107] Scherer Z. When do we lose our parents? Parental mortality is linked to a variety of socio-economic and demographic factors. 2019. Available from: https://www.census.gov/library/stories/2019/05/when-do-we-lose-our-parents.html

[108] van Poppel F, Schenk N, van Gaalen R. Demographic transitions and changes in the living arrangements of children: The Netherlands 1850-2010. Population Research and Policy Review. 2012;**32**(2):243-260

[109] Brausch AM, Muehlenkamp JJ. Perceived effectiveness of NSSI in achieving functions on severity and suicide risk. Psychiatry Research. 2018;**265**:144-150

[110] Halpin SA, Duffy NM. Predictors of non-suicidal self-injury cessation in adults who self-injured during adolescence. Journal of Affective Disorders Reports. 2020;**1**:1

[111] Tatnell R, Kelada L, Hasking P, Martin G. Longitudinal analysis of adolescent NSSI: The role of intrapersonal and interpersonal factors. Journal of Abnormal Child Psychology. 2014;**42**(6):885-896

[112] Nock MK, Prinstein MJ. A functional approach to the assessment of self-mutilative behavior. Journal of Consulting and Clinical Psychology. 2004;**72**(5):885-890

[113] Nock MK. Why do people hurt themselves? New insights into the nature and functions of self-injury. Current Directions in Psychological Science. 2009;**18**(2):78

[114] Klonsky ED, Glenn CR, Styer DM, Olino TM, Washburn JJ. The functions of nonsuicidal self-injury: Converging evidence for a two-factor structure. Child and Adolescent Psychiatry and Mental Health. 2015;**9**(1):1-9

[115] Mars B, Heron J, Klonsky ED, Moran P, O'Connor RC, Tilling K, et al. Predictors of future suicide attempt among adolescents with suicidal thoughts or non-suicidal self-harm: A population-based birth cohort study. The Lancet Psychiatry. 2019;**6**(4):327-337

[116] Daruy-Filho L, Brietzke E, Lafer B, Grassi-Oliveira R. Childhood maltreatment and clinical outcomes of bipolar disorder. Acta Psychiatrica Scandinavica. 2011;**124**(6):427-434

[117] Gama CMF, Portugal LCL, Gonçalves RM, de Souza JS, Vilete LMP, Mendlowicz MV, et al. The invisible scars of emotional abuse: A common and highly harmful form of childhood maltreatment. BMC Psychiatry. 2021;**21**(1):e156

[118] Dhingra K, Boduszek D, Sharratt K. Victimization profiles, non-suicidal self-injury, suicide attempt, and post-traumatic stress disorder symptomology: Application of latent class analysis. Journal of Interpersonal Violence. 2016;**31**(14):2412-2429

[119] Pournaghash-Tehrani SS, Zamanian H, Amini-Tehrani M. The impact of relational adverse childhood experiences on suicide outcomes

during early and young adulthood. Journal of Interpersonal Violence. 2021;**36**(17-18):8627-8651

[120] Smith BC, Armelie AP, Boarts JM, Brazil M, Delahanty DL. PTSD, depression, and substance use in relation to suicidality risk among traumatized minority lesbian, gay, and bisexual youth. Archives of Suicide Research. 2016;**20**(1):80-93

[121] Brockie TN, Dana-Sacco G, Wallen GR, Wilcox HC, Campbell JC. The relationship of adverse childhood experiences to PTSD, depression, poly-drug use and suicide attempt in reservation-based native American adolescents and young adults. American Journal of Community Psychology. 2015;**55**(3-4):411-421

[122] Duarte TA, Paulino S, Almeida C, Gomes HS, Santos N, Gouveia-Pereira M. Self-harm as a predisposition for suicide attempts: A study of adolescents' deliberate self-harm, suicidal ideation, and suicide attempts. Psychiatry Research. 2020;**287**:112553

[123] Quarshie ENB, Waterman MG, House AO. Self-harm with suicidal and non-suicidal intent in young people in sub-Saharan Africa: A systematic review. BMC Psychiatry. 2020;**20**(1):1-26

[124] Nock M. The Oxford Handbook of Suicide and Self-injury. Oxford University Press; 2017

[125] Wang H, Wang Q, Liu X, Gao Y, Chen Z. Prospective interpersonal and intrapersonal predictors of initiation and cessation of non-suicidal self-injury among Chinese adolescents. International Journal of Environmental Research and Public Health. 2020;**17**:1-13

[126] Joiner TE, Ribeiro JD, Silva C. Nonsuicidal self-injury, suicidal behavior, and their co-occurrence as viewed through the lens of the interpersonal theory of suicide. Current Directions in Psychological Science. 2012;**21**(5):342-347

[127] Gardner KJ, Paul E, Selby EA, Klonsky ED, Mars B. Intrapersonal and interpersonal functions as pathways to future self-harm repetition and suicide attempts. Frontiers in Psychology. 2021;**12**:2657

[128] Forbes CN, Tull MT, Richmond JR, Chapman AL, Dixon-Gordon KL, Gratz KL. Motives for nonsuicidal self-injury in individuals with lifetime depressive disorders and posttraumatic stress disorder. Journal of Psychopathology and Behavioral Assessment. 2019;**41**(4):652-661

[129] Mastin TM, Bautista CL, Teng EJ. Nonsuicidal self-injury in veterans with posttraumatic stress disorder: Current theory and implications for practice. Professional Psychology: Research and Practice. 2020;**51**(4):335-340

[130] Victor SE, Styer D, Washburn JJ. Characteristics of nonsuicidal self-injury associated with suicidal ideation: Evidence from a clinical sample of youth. Child and Adolescent Psychiatry and Mental Health. 2015;**9**(1):1-8

Chapter 2

Gender and Modern-Day Slavery: Aggression and Violence in the Context of a Nigerian Focus

Mary Juachi Eteng and Macpherson Uchenna Nnam

Abstract

This chapter explored the various forms of gender-based modern-day slavery in Nigeria. Such modern slaveries as baby factories (unlawful maternity and orphanages where children are sold and their mothers serve as 'economic-slaves, sex-slaves, procreation-slaves, and money-ritual-slaves'), peonage (debt bondage), and early forced marriage were found to be common and on the increase in Nigeria and fundamentally precipitated by patriarchy. The predictors and risk factors of these slavery typologies were supported by the tenets of feminist and political economy theories, which formed the framework. A patriarchal society engenders inequalities, alienation, subjugation, aggression, violence, deprivations, and frustration, with women on the receiving end, when compared to men. The female population is largely the victim, while most perpetrators are males. The new, emerging trend in slavery enterprise are typically organised and largely motivated by women's vulnerabilities and powerlessness, with dehumanising and destructive consequences. Arising from this is the conclusion that certain cultural practices and socioeconomic forces intertwine with poverty, lack of qualitative education, and other exclusions to expose women and girls to servitudes. The problem requires robust intersectoral approaches—that is, coordinated intervention, programmes, and collaborative efforts between governments and local authorities and institutions—to (re)solve.

Keywords: aggression and violent behaviour, baby factory, debt bondage, early forced marriage, gender and modern-day slavery

1. Introduction

One of the major but somewhat overlooked social problem confronting Nigeria is gender-based slavery, which translates into aggression and violent behaviour. The ancient forms of slavery were abolished several decades back, but have been supplanted by 'modern-day slavery'. The resurgence manifests in various dimensions, such as peonage (i.e., debt bondage), forced child labour, early and forced marriage, (child) sex trafficking, sex slavery, and illegal detention of young girls in 'baby factories' (unlawful maternity and orphanages where children are sold and their mothers serve as 'economic-slaves, sex-slaves, procreation-slaves, and money-ritual-slaves').

Eteng *et al*. [1] acknowledged that 'slavery was a common practice in most ancient cultures and civilisations. At present, however, old forms of slavery have continued to disappear, reinvigorated and quickly reintroduced, or are replaced with more agonising but somewhat unnoticed patterns and trends'. The bilateral reports of the International Labour Organisation (ILO) and International Programme on the Elimination of Child Labour (IPECL) revealed that most of the countries experiencing high levels of human trafficking and other forms of modern slavery are typically developing or transitioning countries, whose societies are experiencing some degree of internal strife and/or developmental stagnation [2, 3].

The new or emerging slavery wave has taken completely different dimensions from the ancient forms, despite the abolition and existing punitive measures put in place to grapple with this phenomenon. These modernised forms of slavery flourish on both national and transnational scales and are often driven by globalisation trends. Like other organised economic crimes, such as kidnapping and hostage-taking, Nwadiaro and Nkwocha [4] explained that the problem has been attributed to the rapid urbanisation that was necessitated by the industrialisation of the urban centres. This is because the development of urban centres has destroyed the traditional sense of community that is associated with rural villages and thus undermining the informal mechanism of social control and giving room for various kinds of crime [5].

Although some types of modern-day slavery share certain attributes with trans-Atlantic servitudes, their current patterns and trends have been significantly worrisome in recent times because of the involvement of different classes of people and extreme aggression and violence attached to the criminal enterprise. For instance, Bales [2] stated that human trafficking, like any other forms of contemporary slavery, engenders conditions of modern slavery and severe human rights violations, where victims are exploited for economic gains and sexual gratification, and they remain unable to free themselves from the abusive and exploitative slavery conditions. This usually involves the recruiters, document forgers, brokers, brothel owners, employment agencies, and, in some cases, government officials [3].

Generally, the women population remains the most vulnerable victims, while men are the major perpetrators. But this should not vitiate the fact that men can also be both offenders and victims. Establishing a clear case of gender differentials in the determination of victims and offenders of modern slavery, Bulman [6] explained that women and girls make up more than seven in 10 of the world's modern slavery victims, while 90% of victims of forced labour in the commercial sex industry are females. ILO reported that, while 71% of trafficking victims the world over are women and girls, 29% are men and boys [7, 8]. This constitutes serious human rights violations and structural violence and aggression targeted against women and girls, and is rather more pronounced in patriarchal cultures. As Eteng and Njemanze [1, 9, 10] observed, patriarchy encourages aggression and violence against women, and thus, such crime as slavery is not unexpected in a society where patriarchy is entrenched. The reason is not farfetched: The system makes women, more than any other population in society, structurally powerlessness, culturally susceptible to harm and abuse, socially excluded, and economically incapacitated.

Indeed, young women and children are the most vulnerable victims of baby factories, human trafficking, peonage, forced marriage, and so on. The children are forced to beg for alms on the streets, hawk, or sell articles of trade in motor parks and on highways, while young boys and girls, on the other hand, are trafficked for domestic servitude, pornographic promotion, exploitative labour, forced prostitution, and such other crimes and criminality [1]. Generally, victims suffer abuse and neglect,

harm, mistreatment, exploitation, and extortion, as they try to offset family-accrued debts that put them in bondage or to improve the low socioeconomic conditions that caused their exposure to victimisation. Against this backdrop, this chapter sets out to uniquely explore modern-day slavery as an aggression and violent behaviour in the context of Nigeria, with emphasis on the ever-changing forms, predictors, and risk factors of this social problem. Doing this is a scholarly effort to contribute to the relatively a few existing bodies of knowledge on the phenomenon to understand and explain what works for effective policy direction and interventions.

2. Theoretical framework

Complemented with the principles of the political economy perspective, the feminist theory appears suitable to assist in understanding and explaining the gender and crime of modern-day slavery in Nigeria. As attested by extant and current studies [see 1, 5, 10–15], a critical question that often appears in gender literature has been: 'And what about the women'? Contextually, this question seeks to interrogate the motivation for the exposure of women to the aggression and violent behaviour of baby factories, peonage, early forced marriage, and other slavery conditions. The women's vulnerability to these crimes is intrinsically found in patriarchy, which describes a power relationship inherent in the structures and social relations within which the subordination and exploitation of women occurs and it is used to explain the institutionalisation of male power and domination over women (Walby, 1980, pp. 173–201 as cited in [11], p. 243). Particularly, Nigeria has been described as a society where the practice of patriarchy is deep-rooted with an unbalanced political economy that deprives children and women of certain rights and privileges but favours their male counterparts [1, 10].

An important radical expression of women empowerment since the inception of the feminist movement worldwide is persistent human rights advocacy as it affects women under patriarchal hegemony. This advocacy has been consistently pursued by several women groups through the mass media, legal battles, demonstrations, social criticisms, and intellectual discourses, as typified by recent happenings in Nigeria and the world over (see [10–15]). Yet, women are increasingly exposed to aggression and violence that are somewhat unnoticed or sometimes noticed but ignored, because such acts find justification(s) in the culture and traditions of the people. This is where feminism coincides with political economy to further explain the enslavement and exploitation of women. Both theories emphasised contradictions arising from the social, political, and economic arrangements of society. Nigeria has been described as a class-determined and class-structured society that is in perpetual conflict [10]. The contradiction is mostly favourable to men, while children and women are at disadvantage. The reason is not that men are more diligent and resourceful when compared to women, but 'communal wealth' is fundamentally determined by the culture and tradition of our society which are strongly patriarchy-oriented.

The expectations of feminism interact with political economy underpinnings to critically analyse gender as a determinant of modern-day slavery in Nigeria. The two theories explain how the sociocultural system provides a framework for dominance and determines class struggle and power relations that detect who (mainly women) to use as slaves under any pretext. Patriarchy breeds both relative and marginal poverty, inequalities, alienation, and social exclusion, with women and children bearing the brunt of this structural violence and aggression [1]. From the political economy

perspective, for instance, people of lower-class status experience sociopolitical deprivations, frustration, inequalities, aggression, and violence.

Men are also affected by these challenges, but women are the most vulnerable population; this is so because their plight correlates with patriarchal practices—this also supports the feminist theory. Carlen [16], and Heidensohn [17] explained that male-dominated patriarchal societies encourage exploitation, manipulation, aggression, and violence against women, making it easier and more successful for them to be used in committing the crime. Others agreed that, for a better understanding of the pattern of crime, including slavery and other forms of servitude, the analysis should be inseparably linked to political economy, particularly unemployment, inequality, and patriarchy, which are the characteristic of most capitalist societies [5, 10, 18].

Like political economy variables, the feminist theory addresses the issue of gendered modern-day slavery against the background of gender inequity and gender bias in society. Explanations have been provided by some feminists as to why this is the case. While different brands of feminism attempt to provide a partial and provisional answer to the woman question, they nevertheless intersect to explain ways in which women have been oppressed and suppressed in society (see also [5, 10, 11, 19]). As underscored by the political economy perspective, two main feminist theories are relevant to this research: Marxist and radical feminists.

Like political economy theorists, Marxist feminists strongly believe that the relegation of women is connected to capitalist exploitation of their inherent domestic role. They also recognise the presence of a 'dominant ideology' (patriarchy) that places women as primary caregivers in the family and community and which is used to rationalise the low status and wage assigned to women, as well as their deprivation of socioeconomic freedom [11, 20]. The advocates of Marxist feminism argued that the situation of 'relative powerlessness would have been otherwise were women's production and gender roles in the family, at the workplace, and in the society not subordinated to those of men' ([1], p. 96).

Radical feminists see the underlying causes of women's inequality, gender bias, and inequity as deeply rooted in society. The inequity and gender bias against women, including aggression, violence, and human rights violations, could be traced to the patriarchal system of power relations in highly patriarchal societies, such as Nigeria. Furthermore, they draw attention to the neglect of reproduction and derived subordinate sex role of women in the household, which could be traced to the patriarchal system of power relationships in any given society [20]. Taking advantage of women's vulnerability and relative powerlessness, perpetrators of modern-day enslavement who are mainly men lure their female victims into the sex trade, baby factories, debt bondage, child labour, and early and forced marriage.

Radical feminists explain that, because of its patriarchal nature, the family could be the main staging point for perpetuating crimes against women. When it comes to decision-making, families could take overpowering decisions, virtually forcing their female children into the sex trade as a way of making quick money to lift the family from poverty. For sex trafficking, persons who are usually induced to perform such acts are most times under-aged, below the age of 18 years. In addition to being subjected to work as economic slaves and to perform other forms of labour such as live-in domestic workers and factory workers, most of the times the female victims of trafficking are forced to work in the sex trade. Consequently, female victims of trafficking suffer double exploitation, both as economic slaves and as sex slaves (United Nations Office on Crime and Drugs, UNODC, [21]).

Still on this, a forced marriage occurs when an individual is coerced, threatened, or tricked to marry without his or her informed consent (The [22]), and this could happen to any gender, male or female, young or old, and is oftentimes involves pressure, abuse, aggression, and violence. It is pertinent to note here that a marriage that is performed under duress and without free and informed consent or free will of both parties could be regarded as a forced marriage. Eteng and Njemanze [9] agreed that a forced marriage could be seen as one in which one or both of the parties involved are married without his or her consent or against his or her will. Forced marriages mainly occur early in life in the form of betrothal and by abduction. A marriage that is forced could be considered as an act of aggression, violence, and violation of the human rights of those affected and is also seen as a form of slavery, as it were.

3. Forms of modern-day slavery and their consequences

Modern-day slavery in Nigeria manifests in various forms, but only those ones that seem peculiar and recurring with dire consequences are explained, and they are 'baby factories', peonage (debt bondage), and early and forced marriage.

3.1 Baby factory

The term 'baby factory' is often used by Nigerian journalists to describe criminal activities involving restriction of a person's movement against such person's will, forced impregnations, sale of babies, and illegal adoptions [23]. Policy interventions and scholarly efforts aimed at understanding and explaining the problem are inadequate. Even data on the crime of baby factories are hardly found in the academic literature; rather, the incident is mainly reported in the media, especially magazines and newspapers. Therefore, undertaking this research is to further contribute to the few existing scholarly works on the subject for practical outcomes in policy response. An understanding of the meaning and workings of the baby factory as modern-day slavery would provide a policy guide and interventions aimed at curbing the trend. This, then, calls for the definition of a baby factory as an illegal clinic, maternity, or orphanage where young girls and women with unwanted pregnancies are kept for reasons ranging from money-making, illicit procreation, and coerced sexual exploitation to murder for ritual and child-selling. The business is unlawful, with huge benefits for owners and their accomplices, while victims are threatened and forced to accept enslavement, aggression, and violence as normal [1].

Studies (see United Nations Organisation for Education, Science, and Culture, UNESCO, [1, 23–26]) consistently show that the first cases of the baby factory in Nigeria were officially reported in 2006 by UNESCO and was then classified as child trafficking prevalent in the southeast part of the country. Later identified incidents occurred across Southern Nigeria, particularly Lagos State, and the phenomenon followed similar trajectories. For instance, pregnant teenagers or adult women with unwanted pregnancies approach doctors, clinics, nurses, or orphanages that subsequently take care of these girls and women during their pregnancies. When babies are born, they are sold to childless couples or couples who are desperate to have a child. The natural mothers of the babies then signed papers, repudiating their ownership or claims on the babies, and thereafter receive monetary compensations [1, 23–25].

In 2011, The Telegraph [27] reported that police officers, on a tipoff, raided Cross Foundation premises in Aba, Abia State of Nigeria, where pregnant girls between the

ages of 15 and 17 were confined to 'make babies' (give birth to children for sale) for the proprietor, who sell them to clients. The 32 pregnant young girls and women who were rescued by the police confessed to the crime, stating that they have accepted to sell their awaiting newborn babies, as they were convinced by the owner of this Foundation. These babies would then be sold to buyers for any amount ranging from N300, 000.00 (about $667) Naira to N1, 000000.00 (about $2222) [27], depending on the sex of the baby (a boy child is more expensive than a girl child in the southeastern states of Nigeria).

Eteng and her associate [1] summarised the studies of [26, 28–30] on baby factories and reached the conclusion that the crime is on the increase with horrific outcomes. From these sources, the situation often involves teenage girls and young women brought by traffickers to clinics and homes referred to as 'baby factory' with the promise of jobs, safe abortions, and even money after delivery. The victims are then confined and forced to give birth, with some of them trafficked while being pregnant, and others impregnated at the baby factory by men hired to do so. As further summarised by Eteng et al. [1], owners of baby factories often claim that babies are put up for adoption by childless couples, whereas, in reality, child labour, sexual exploitation, and even ritual are the reasons for their establishment. Even human traffickers obtain their victims from baby factories, operating under the cover of 'maternity homes', 'hospitals', or 'orphanages'; the act is both a profitable illegitimate business and a new form of human trafficking in Nigeria [23].

To state the obvious, statistics on baby factories in Nigeria are mainly found in newspapers and magazines [1], so this chapter is a contribution to the dearth of scholarly literature on the phenomenon with the aim of providing a policy guide. For these authors, 'the problem seems to have peaked between 2008 and 2013' ([1], p. 4). In May 2008, according to [23], a case of a baby factory was reported to the Nigeria Police Force (NPF) in Enugu State and the formation swung into action that led to the rescue of 25 teenage girls housed in a baby factory. While 32 victims were freed from captivity in a baby factory located in Aba in June 2011 by NPF, 17 pregnant girls were rescued in Lagos State in October of the same year. A maternity home that belongs to Madam One Thousand in the Umuaka community of Imo State was raided by the police in May 2013. The outcome resulted in the rescue of 26 teenage girls, 17 pregnant teenagers, and 11 babies. This was followed by the June 2013 police operation that led to the rescue of 16 pregnant teenagers in a baby factory situated in Aba [1, 30].

3.2 Peonage (debt bondage)

The ILO Convention No. 182 includes debt bondage as a form of slavery that results in aggression and violence. A person is subjected to peonage or debt bondage when such a person is compelled through force or abuse to work against their will to pay off debts. The situation is particularly debilitating if the value of the work is not actually directed towards the payment of the debt. So many children are pushed into child labour or marriage to settle parental debt burden. Some young girls may be affianced to elderly men, old enough to be their father or grandfather, due to the inability of their parents to pay certain debts. The implication is that girls from affected families become a collateral and mortgage with which parents settle their debts. This is done without considering the psychosocial effects of such actions or inactions on the child (see also [31]).

The practice of peonage is prevalent in India and Nigeria, and is sometimes used to settle conflicts. In this case, a girl child could be given out in marriage to a particular

person in compensation for an offence that her parents, family, or community committed against the person. The consent of the girl does not count. A Nigerian example was specifically depicted by Achebe [32] in his classical book titled 'Things Fall Apart'. In this work, Achebe reported that a woman (the wife of Ogbuefi Udo) from Umuofia was killed by the people of Mbaino. The people of Umuofia met and agreed to send emissaries to Mbaino to ask whether they wanted war or peace. And, to achieve peace, the people of Mbaino gave a young lad and virgin girl to Umuofia. The virgin girl was then given to Ogbuefi Udo to replace his murdered wife. By this action, the young girl was forced to marry the old man—Ogbuefi Udo without her understanding and approval. This is also tenable in real-life situations in Nigeria.

3.3 Early forced marriage

Although early forced marriage affects both boys and girls, the majority of victims are girls. According to United Nations Children's Fund (UNICEF), it is estimated that 11% of women worldwide were married before the age of 15 years. Boys are also affected by this practice, but the majority of those who suffer slavery that manifests in the form of child marriages are girls [33]. A multi-country study by women living under Muslim laws in 2013, as cited in ref. [9], revealed that the practice of marrying out girls at a young age is rampant in the developing countries of the world. These are specific countries in sub-Saharan Africa, Asia, and Latin America. It was revealed that marriages of girls between the ages of 16 and 18 are not uncommon in some areas of Eastern Europe. Marriages at or shortly after puberty are also prevalent in the Middle East, North Africa, and some other parts of Asia. Data collected by UNICEF in 2005 showed that, in South East Asia, women between the ages of 18 and 24, representing 48%, were married out before attaining the age of 18; 42% in Africa; and 29% in Latin America and the Caribbean [9].

Worldwide, it is estimated that 15 million girls, with some as young as 5 years old, are forced into marriage every year; over 700 women alive today were married as children; one in every three girls in the developing world married before 18 and one in nine marry before the age of 15 [34]. Early forced marriage, which is synonymous with child forced marriage, is regarded as a form of slavery in some quarters. This could be the case if the child has not genuinely given his or her free and informed consent to enter into the marriage relationship. Other reasons are if the child is subjected to control and a sense of ownership in the marriage (maybe through abuse, threats, violence, and humiliation), or if the child is subjected to non-consensual sexual affairs and cannot leave or end the marriage that could lead to lifetime slavery. Early forced marriage could also be in the form of betrothal. In this case, the parents of the under-aged girl enter into a marriage contract with a future husband for their daughter. At times, this involves cohabitation between the girl and the man. The girl may be ignorant of the relationship and will have to be informed after a while. This practice used to be associated with the Igbo in the southeastern part of Nigeria, but nowadays, the practice has significantly reduced.

Marriage by abduction, also known as bride capture, is another form of early forced marriage found mainly in Central Asia and parts of Africa. Adom Television [35] reported that this is a practice where a man abducts the girl he wishes to marry. The victim is often raped to lose her virginity, and this makes it easy for them would be groomed to negotiate a bridewealth (price) with the elders of the community. The girl is forced to accept as she is now seen as impure, having lost her virginity, and may face ostracism if she refuses to marry the man. This practice is also common in some

parts of Taraba State in Nigeria, although it has gone through some modifications in recent times. At present, the groom may approach the girl's parents and express his interest in marrying their daughter. The man may entice the girl's parents with gifts or other incentives. Once the parents have consented, the girl's opinion becomes irrelevant. They will then arrange and send their daughter on an errand and inform the groom to waylay and 'steal' her. The following day, the man will visit the parents of the girl to inform them that their daughter is now with him. At that point, the other marriage rites begin.

In conflict areas, girls and women are sometimes forced to marry men on either side of the conflict. Girls are captured as war victims, raped, and forced into marriage. It was reported recently in Nigeria that some women and young girls captured by the Boko Haram insurgents were raped and forced into marriage. Many of them were carrying unwanted pregnancies when the Nigerian soldiers rescued them from Punch Newspaper [36]. Young girls have been forced into marriage as part of the settlement of disputes between families. In this instance, a girl is given out in marriage to serve as punishment for a crime committed by her male relatives. This is practised in Pakistan and even in Nigeria, as could be seen from the earlier presented narrative of Onwe [31]. ILO [7] reported that the mental torture, abuse, brutalisation, exploitation, and dehumanisation that they experience usually lead to lowered self-esteem. The social stigma attached to this is usually difficult for the victims and their families to bear. This is why some victims are usually unwilling to testify in court in pending cases. In some developing countries, such as Nigeria, India, and Pakistan, modern-day slavery has taken the forms of debt peonage, early and forced marriage, forced child labour, or involuntary servitude.

4. Conclusion and policy implications

Having explored some of the forms of modern-day slavery peculiar to Nigeria, it has become very clear that women are more vulnerable and bear the brunt of it all. They are exploited and used both as economic and sex slaves. These have continued despite all forms of laws that have been put in place by the United Nations and the Nigerian government to protect women against aggression, violence, and human rights abuses. Modern servitudes require inter-State action and collaborative efforts of security operatives from the States/communities victims are trafficked and the destination State/communities to effectively tackle this crime.

However, it is not just enough for NGOs and isolated governments to rescue victims and rehabilitate them. More drastic measures should be taken to crumble this business of modern-day slavery, particularly the baby factory. To this end, efforts should be made to increase awareness and rally the world to fight against this scourge. Just as the world saw the evils of the trans-Atlantic slave trade and abolished it, proper legislations should be made so that countries whose citizens are involved in the business of modern slavery should be made to face global sanctions through the United Nations. Furthermore, since women are the worst victims of early and forced marriage, peonage (debt bondage), and baby factory, concerted efforts should be made by the State security forces to enforce the extant laws and already existing human rights provisions to protect women in the various States in Nigeria where this aggression and violent behaviour is still in practice.

All levels of government in Nigeria (federal, state, and local), nongovernmental organisations, religious institutions, and local authorities and institutions should

be more involved in the creation of awareness at the grassroots level on the harmful effects of modern-day slavery in all its ramifications. For wide coverage and practical outcomes, the sensitisation has to be done in local parlance and languages using jingles, radio, television, and the print media. Rescued victims should also be encouraged to expose the perpetrators as part of an effort to fight the menace.

The female population is largely the victim, while most perpetrators are males. The trend in slavery enterprise is typically organised and largely motivated by women's vulnerabilities and powerlessness, with dehumanising and destructive consequences. Arising from this is the conclusion that certain cultural practices and socioeconomic forces intertwine with poverty, lack of qualitative education, and other exclusions to expose women and girls to servitudes. The problem requires robust intersectoral approaches—that is, coordinated intervention, programmes, and collaborative efforts between governments and local authorities and institutions—to (re)solve.

Conflict of interest

The authors declare no conflict of interest.

Author details

Mary Juachi Eteng[1] and Macpherson Uchenna Nnam[2*]

1 Department of Sociology, Alex Ekwueme Federal University Ndufu-Alike, Abakaliki, Ebonyi State, Nigeria

2 Department of Criminology and Security Studies, Alex Ekwueme Federal University, Ndufu Alike, Abakaliki, Ebonyi State, Nigeria

*Address all correspondence to: icharilife@yahoo.com

References

[1] Eteng MJ, Nnam MU, Nwosu IA, Eyisi EC, Ukah JA, Orakwe EC. Gender and modern-say slavery in Nigeria: A critical analysis of baby factory and terrorism. Aggression and Violent Behavior. 2021;**58**:101549. DOI: 10.1016/j.avb.2021.101549

[2] Bales K. Disposable People: New Slavery in the Global Economy. 2nd ed. Berkeley: University of California Press; 2004

[3] Ndifon CO, Apori KA, Ndifon RA. Human trafficking in Nigeria: A metaphor for human rights, crime and security violations. American Journal of Social Issues & Humanities. 2012;**2**(3):84-99

[4] Nwadiaro EC, Nkwocha DI. Kidnapping for ransom: A prevalent urban pandemic in Nigeria. Research Journal of Peace and Conflict Studies. 2011;**1**(1):18-28

[5] Haralambos M, Holborn M, Heald R. Sociology: Themes and Perspectives. 7th ed. London: HarperCollins; 2008

[6] Bulman M. Women and Girls Make Up 'Nearly Three Quarters' of Modern Slavery Victims. 2017. Available from: http://www.independent.co.uk/news/uk/home-news/modern-slavery-victims-women-girls-majority-worldreport-a7954066.html. [Accessed 29 January 2019]

[7] International Labour Organisation. Domestic workers convention No. 189. In Child Labour and Domestic Work. 2011. Available from: http://www.ilo.org/ipec/areas/Childdomesticlabour/lang--en/index.htm. [Accessed 5 March 2018]

[8] Enumah A. Nigeria: U.S. Envoy – 24.9 Million People Trapped in Modern-Day Slavery. 2018. Available from: https://allafrica.com/stories/201807310028.html. [Accessed 26 February 2020]

[9] Eteng MJ, Njemanze V. Child abuse, gender and social work. In: Ifeanacho M, editor. Gender Issues in Social Work. Port Harcourt: University of Port Harcourt Press; 2018. pp. 64-91

[10] Nnam MU, Arua MC, Otu MS. The use of women and children in suicide bombing by the boko haram terrorist group in Nigeria. Aggression and Violent Behavior. 2018;**42**:35-42

[11] Burke RH. An Introduction to Criminological Theories. 5th ed. New York: Routledge; 2019

[12] Jaggar AM. Feminist Politics and Human Nature. Lanham, MD: Rowman and Littlefield; 1983

[13] Daly K, Chesney-Lind M. Feminist and criminology. Justice Quarterly. 1988;**5**(4):487-535

[14] Chesney-Lind M, Sheldon RG. Girls, delinquency, and juvenile justice. Pacific Grove, CA: Books/Cole; 1992

[15] Schuster J. Invisible feminists? Social media and young women's political participation. Political Science. 2013;**65**(1):8-24

[16] Carlen P. Women, Crime, and Poverty. Milton Keynes: Open University Press; 1988

[17] Heidensohn F. Women and Crime. London: Macmillan; 1985

[18] Taylor D. The political economy of crime. In: Maguire M et al., editors. The Oxford Handbook of Criminology. 2nd

ed. Oxford: Oxford University Press; 1997

[19] Ritzer G. Sociological Theory. 8th ed. New York: McGraw-Hill; 2011

[20] Beechey V. Some notes on female wage labour in capitalist production. Capital and Class. 1977;**1**(3):45-66

[21] United Nations Office on Drugs and Crime. A Global Report on Trafficking in Persons. 2018; Available from: www.unodc.org/unodc/en/human-trafficking/global-report-on-trafficking. [Accessed: 13 August 2018]

[22] The AHA Foundation. Forced Marriage. 2015. Available from: www.theahafoundation.org/forced-marriage. [Accessed 12 April 2020]

[23] Huntley SS. The Phenomenon of Baby Factories in Nigeria as a New Trend in Human Trafficking. 2013; Available from: http://www.internationalcrimesdatabase.org. [Accessed: 26 November 2015]

[24] United Nations Educational, Scientific and Cultural Organisation. Human Trafficking in Nigeria: Root Causes and Recommendations (Policy paper, No. 14.2 (E)), 7. 2006; 27. Available from: http://unesdoc.unesco.org/images/0014/001478/147844E.pdf. [Accessed: 26 November, 2015]

[25] Ordu GEO, Nnam MU. Baby factory as an emerging form of human trafficking in the south-East Nigeria. In: Iwarimie-Jaja D, Agwanwo DE, editors. Contemporary Criminality in Nigeria: Challenges and Options. Ibadan: Stirling-Horden Publishers; 2017. pp. 146-164

[26] Ikumola AD. Baby factory in Nigeria: Contending salient issues in human trafficking. In: Iwarimie-Jaja D, Agwanwo DE, editors. Contemporary Criminality in Nigeria: Challenges and Options. Ibadan: Stirling-Horden Publishers; 2017. pp. 177-210

[27] The Telegraph. Nigerian 'Baby Factory' Raided and 32 Teenage Girls Freed. 2011. Available from: http://www.telegraph.co.uk/news/worldnews/africaandindianocean/nigeria/8550792/Nigerian-baby-factory-raided-and-32-teenage-girls-freed.html. [Accessed: 26 November 2015]

[28] Horrell S, Humphries J. The exploitation of little children: Child labour and the family economy in the industrial revolution. Exploration in the Economic History. 1995;**32**:485-516

[29] Kalu U. How Child Trafficking Network Operate in South East Nigeria. 2011. Available from: http://www.vanguardngr.com/2011/07/how-child-trafficking-network-operates-in-south-east-nigeria. [Accessed 14 June 2015]

[30] British Broadcasting Corporation. Nigeria 'Baby Farm': Girls Rescued by the Abia State Police. 2011. Available from: http://www.bbc.com.news/world-africa-13622679. [Accessed 25 June 2011]

[31] Onwe SO. Championing the campaign against child abuse in Nigeria: A call to save the needy. International Journal of Humanities and Social Sciences. 2014;**4**(1):1-12

[32] Achebe C. Things Fall Apart. New York: Anchors Books; 1959

[33] United Nations Children's Fund. Early marriage: A harmful traditional practice. In: In the United Nations General Assembly of 7 November 1962, Article 1, the Convention on Consent to Marriage, Minimum Age for Marriage, and Registration of Marriage. Geneva: The Author; 2005

[34] Global Affairs Canada. Child, Early and Forced Marriage. 2016. Available from: http://www.international.gc.ca/rights-droits/childmarriage-mariageenfants/index.aspx?lang=eng. [Accessed: 20 May 2018]

[35] Adom TV. Marriage by Abduction – Afisem in Sisala East Constituency. 2014. Available from: https://www.youtube.com/watch?v=15r3hXc6h20. [Accessed 16 February 2019]

[36] Punch Newspaper. UN Tasks Nigeria on Stigmatisation of Boko Haram Wives and Children. 2018. Available from: https://punching.com/un-tasks-nigeria-on-stigmatisation-of-Boko-haram wives-children/. [Accessed 16 February 2019]

Chapter 3

Emotional Intelligence and Its Role as a Protective Factor against Symbolic Gender Violence in Peruvian Women

Noelia Rodríguez-Espartal and Daniela Ramírez Meneses

Abstract

This chapter presents the results of an investigation that aimed to identify the manifestations of symbolic gender violence and its relationship with emotional intelligence, as a protective factor against it, in 225 women from Metropolitan Lima and Callao (Peru). For this, a quantitative methodology research was carried out, which allowed exploring the relationship between the subdimensions of both variables. The results indicate that higher levels of emotional intelligence, specifically the dimension of emotional perception, present an inverse relationship with the dimensions of symbolic violence, acting as a protector against this type of gender violence against women. Likewise, differences were found in all the sociodemographic variables analyzed. These results are encouraging for the approach, prevention, and intervention of gender violence, in a country in which it is very present.

Keywords: symbolic gender violence, emotional intelligence, gender roles, gender violence, peruvian women

1. Introduction

Gender violence as a phenomenon has been present over the years, including different behaviors that were deemed as socially acceptable not long ago [1, 2]. However, it is now considered a violation of human rights and a public health problem; because of that, the social awareness surrounding the topic is increasing and its eradication has gained importance [3–6].

Despite the efforts, it still is an issue in present society, reaching alarming figures. In 2019, 4640 femicides were registered in Latin America [7], 168 of which were in Peru [8]. In 2020, the context of the COVID-19 pandemic and its consequent lockdown measures, women and young girls were at larger risk because of how difficult it was to distance themselves from their aggressors or to ask for external help [9, 10]. In 2022, just during January, 141 adult women and 378 girls and adolescents were reported as missing and 18 femicides were registered [11].

Gender violence is defined as any act of violence based on gender that can result in physical, sexual, or psychological damage, and that takes place both in private and public spheres [12, 13]. It is relevant to consider that this type of violence mainly affects women [14, 15]. Furthermore, given its complexity, it is based on cultural and behavioral patterns that devalue femininity and, therefore, promote inequality [6]. In that sense, it is argued that every act of gender violence implies symbolic violence due to its cultural and historical base [16].

So, symbolic violence, a construct proposed by Bordieu [17, 18], is the submission of one group to another through a socialization process that naturalizes the power dynamics in such a way that gender-based asymmetry becomes unquestionable. This process is called "habitus" [19] and works as a scheme of thought, vision, and action those social agents incorporate over time, shaping practices that fit these schemes [19, 20]. Consequently, there is a kind of "voluntary submission," which the oppressed group justifies and ends up establishing the relationship of dominance that it is a part of Calderone [20] and López [21]. In the context of a patriarchal system, symbolic violence perpetuates its functioning [22], and it is common for women to apply the mental schemes proposed by the dominant group without questioning them [17, 18, 23]. In turn, this makes the identification of this type of violence a more complex process [16].

It is argued that the symbolic functions as a classification system [22, 24]and since gender classifies and hierarchizes the world [25], this system will be the basis of the present investigation. Therefore, it is necessary to recognize that symbolic violence perpetuates the functioning of a patriarchal system that is already in place [22]. There are existing unequal relationships of power between men and women that respond to a social structure that is already historically and culturally established [16]. In this context, the difference between the sexes will mark both the objective of social structures and the subjective of mental structures, which will result in male dominance that is reinforced through customs and discourses, without the need for justification or coercion [18].

Thus, direct violence (where the aggressor is identified easily) is not needed to have a negative effect on women's opportunities, wellbeing, identity, or freedom [26]. A diverse range of conducts are identified as habitual, which brings us to see them as normal; the resistance against them decreases, as well as the criticism and opposition to the aggressor and their behavior, so all of it gets integrated into a routine [27]. Because of that, symbolic violence also encompasses the messages, values, signs, and icons that can reproduce and/or transmit relations of domination, inequality and discrimination, which naturalize the subordination of women in society [28]. Therefore, myths, roles, and stereotypes that depict women and men differently must be considered [29].

Despite what is discussed, symbolic violence has not been studied from a psychological perspective. However, promoting research on the topic, in general, continues to be crucial [30], given that investigations help to create intervention programs that respond to the needs of those involved, such as prevention programs that allow a better understanding of the phenomenon to act in a more effective way [6]. On that account, recent studies link healthy emotional development with violence prevention on the context of dating [31]. Therefore, it is important to study the relationship between violence against women and constructs such as emotional intelligence, given that they can function as a protective factor [6].

Salovey and Mayer's [32] model will be used to define emotional intelligence (EI), given its coherence, rigor, and empiric evidence [33]. According to the authors, the EI encompasses "the ability to perceive, assess, and express emotions with precision; the ability to comprehend emotions and emotional knowledge; and the ability to regulate emotions that promote intellectual and emotional growth" (as cited in Jiménez & Lopez-Zafra, [34]). Because of this, an effective adaptation to the environment is achieved through the adaptive use of emotions, considered regulatory and determinant of behavior, both on interpersonal and intrapersonal levels [6, 29].

As it was mentioned, the relationship between EI and violence against women has already been studied; nevertheless, it is relevant to study its possible relationship with symbolic violence. Because of that, the general objective of this investigation is to identify the relationship between symbolic violence and emotional intelligence in women from metropolitan Lima and Callao. Consequently, the following hypotheses are raised:

Hypothesis 1: Higher scores of symbolic violence will link to lower scores of emotional intelligence.

Hypothesis 2: Significant Differences will be found in the constructs of symbolic violence and emotional intelligence according to the socio-demographic variables.

2. Method

2.1 Participants

The sample included 225 women, whose ages fluctuated between 18 and 61 years old (M = 30.38, SD = 12.31). 84.9% of them were born in Lima, 11.6% in a province, and 8% abroad. Most of the women in the study had an incomplete college degree (44%), were considered to have a medium socioeconomic status (56.4%), and identify themselves as catholic (72.4%). Plus, most of them were single (38.2%) and identified themselves as heterosexual (88.9%). As to whether they had children, 74.7% did not and 25.3% were mothers. Finally, the most significant sentimental relationship they had lasted an average of 76.57 months (ST = 101.49).

2.2 Measurement

Symbolic Violence Scale [5]. The scale has 40 items divided into three subscales. The answers are rated according to a Likert scale with scores ranging from1 to 4 (1 = Strongly disagree y 4 = Strongly agree). In this study, high levels of reliability were reached both in the total scale (α = .94) and subscales: internalized aspects (α = .92), interpersonal aspects (α = .90), and external aspects (α = .79).

Trait Meta-Mood Scale (TMMS-24) [35]. The scale has 24 items divided into three dimensions. The answers are rated according to a Likert scale (1 = Strongly disagree y 5 = Strongly agree). In the present investigation, high levels of reliability were reached in the subscales: emotional perception (α = .90), emotional comprehension (α = .94), and emotional regulation (α = .89).

Socio-demographic data sheet: A sheet was used to collect sociodemographic data (age, sexual orientation, civil status, number, gender of children, etc.).

2.3 Procedure

This investigation was part of an investigation course to get a bachelor degree in Psychology. The application of the instruments was virtual through a Google Form shared on social media. It included the informed consent, which showed the study objectives and the measures to keep confidentiality and anonymity of the participants.

3. Data analysis

After the creation of the database, the statistical analyses were carried out. First, the descriptive analyses were calculated to obtain the sociodemographic characteristics of the participants, and then evaluate the reliability of the instruments used. Subsequently, the normality tests were performed using the Kolmogorov-Smirnov statistic to determine the distribution of the scores, which showed that the data did not follow a normal distribution. For this reason, a correlational analysis was performed using Spearman's coefficient to respond to the objectives of the study. Finally, we proceeded to analyze the significant correlations to deepen the results obtained.

4. Results

The results of the study are presented below, according to the constructs studied and the hypotheses stated, which respond to the general objective of the present investigation.

Hypothesis 1: Higher scores of symbolic violence will link to lower scores of emotional intelligence. From the results (**Table 1**), it is stated that the first hypothesis is confirmed partially, given that some dimensions of the studied constructs have a relationship.

Hypothesis 2: Significant differences will be found in the constructs of symbolic violence and emotional intelligence according to the socio-demographic variables. To achieve this, the links between these variables were identified, including age, sexual orientation, place of birth, residence time in Lima, civil status, whether or not they had children, the number of children and their gender, most significant relationship duration, type of relationship, whether or not it is their current partner, academic degree, socioeconomic status, and religion (**Table 2**).

Measure	Internalized aspects	Interpersonal aspects	Total symbolic violence
Emotional perception	−0.370**	−0.341**	−0.333*

*Note: N = 225. **p < .01.*

Table 1.
Correlations between emotional intelligence and symbolic violence.

Extent	Emotional intelligence				Symbolic violence							
	Emotional perception		Emotional understanding		Internalized aspects		Interpersonal aspects		External aspects	Total symbolic violence		
			—						—			
Age	−.41**				.31**		.24**			.26**		
	Mdn	STD	—		Mdn	STD	Mdn	STD	—	Mdn	STD	
Adolescence	32	5.02	—		24.5	9.62	18.5	3.93	—	55	19.36	
Youth	29	6.45	—		29	9.14	18	5.53	—	62	15.42	
Middle adult	21.5	5.47	—		38.5	8.98	24	7.25	—	75	17.67	
			—						—			
Sexual orientation	.13*				−.25**		−.17**			−.22**		
	Mdn	STD	—		Mdn	STD	Mdn	STD	—	Mdn	STD	
Heterosexual	26	6.75	—		33	9.48	19	6.22	—	66	16.67	
Lesbian	21	5.51	—		45	5.86	28	1.53	—	86	7.77	
Bisexual	32	5.96	—		23	5.69	16	3.23	—	54	10.14	
Time of residence in Lima	—		.33*		−.41*		—		—	—		
	—		Mdn	STD	Mdn	STD	—			—		
More than 10 years	—		31	6.30	32	9.89	—		—	—		
Less than 10 years	—		24	7.7	41	10.66	—		—	—		
Civil status	−.30**		—		.26**		.18**		—	.21**		
	Mdn	STD	—		Mdn	STD	Mdn	STD	—	Mdn	STD	
Single	29.5	6.57	—		29	8.59	18	5.27	—	62	14.82	
In a relationship	29	6.32	—		28	8.87	17	4.80	—	61	14.74	
Cohabitant	26.5	6.09	—		43	7.97	26.5	7.00	—	88.5	17.63	

Extent	Emotional intelligence			Symbolic violence							
	Emotional perception		Emotional understanding	Internalized aspects		Interpersonal aspects		External aspects		Total symbolic violence	
Married	23.5	5.70	—	40	10.44	24.5	7.98	—		77.5	20.05
Separated	18	2.08	—	38	8.51	24	4.04	—		73	14.64
Divorcee	17.5	4.98	—	3.5	5.6	17.5	5.24	—		61.5	12
Do you have sons or daughters?	.38**		—	−.35**		−.26**		.15*		−.28**	
	Mdn	STD	—	Mdn	STD	Mdn	STD	Mdn	STD	Mdn	STD
Yes	22	5.36	—	39	8.53	24	6.03	13	3.56	76	15.20
No	29	6.52	—	28.5	9.17	18	5.9	15	4.47	61	16.45
Number of sons and daughters	.38**		—	.34**		.28**		−.14*		.28**	
	Mdn	STD	—	Mdn	STD	Mdn	STD	Mdn	STD	Mdn	STD
0	29	6.52	—	28.5	9.17	18	5.90	15	4.47	61	16.45
1	23	5.50	—	40	9.67	23	6.61	12	3.36	74	17.05
2	21	5.07	—	37	7.41	25	6.01	14	4.02	77.5	14.44
3	22	6.18	—	39	8.30	24	4.50	16	2.41	75	13.46
4	26	—	—	29	—	26	—	11	—	66	—
Number of daughters	.34**		—	.34**		.28**		−.13*		.29**	
	Mdn	STD	—	Mdn	STD	Mdn	STD	Mdn	STD	Mdn	STD
0	29	6.61	—	29	9.31	18	5.82	15	4.51	61	16.50
1	21.5	4.96	—	40	7.88	26	6.42	13	3.34	77.5	14.68
2	22	4.84	—	41	8.93	25	5.22	14	2.70	81	15.15
3	32	—	—	39	—	20	—	16	—	75	—

Extent	Emotional intelligence			Symbolic violence							
	Emotional perception		Emotional understanding	Internalized aspects		Interpersonal aspects		External aspects		Total symbolic violence	
Number of male children	−.26**			.21**		.23**		—		.19**	
	Mdn	STD	—	Mdn	STD	Mdn	STD	—		Mdn	STD
0	28	6.66	—	30	9.56	18	6.06	—		63	16.65
1	22	6.18	—	40.5	7.85	27	5.43	—		80	14.33
2	20	4.07	—	32	8.63	19	3.47	—		65	12.88
3	26	—	—	29	—	26	—	—		66	—
Length of relationship	−.30**			.31**		.30**		—		.28**	
	Mdn	STD	—	Mdn	STD	Mdn	STD	—		Mdn	STD
Up to 10 years	28	6.66	—	29	9.49	18	5.98	—		61	16.78
Up to 20 years	25	5.48	—	40.5	8.51	26.5	5.03	—		80.5	12.64
Up to 30 years	22.5	4.97	—	38	6.70	24.5	6.75	—		74.5	14.59
Up to 40 years	18.5	2.87	—	39.5	2.45	26.5	2.08	—		79.5	4.55
More than 40 years	19.5	6.36	—	36.5	10.61	24.5	4.95	—		74	16.97
Relationship type	−.26**		—	.28**		.22**		−.20*		.20**	
	Mdn	STD	—	Mdn	STD	Mdn	STD	Mdn	STD	Mdn	STD
In love	29	6.58	—	28	9.13	18	5.2	15	4.35	61.5	15.29
Engagement	26	6.44	—	28	8.02	16	5.72	11	2.71	57	15.27
Cohabitants	31	5.62	—	41	6.70	27	5.78	15	3.27	82	13.51
Marriage	22	5.04	—	28	10.02	24	7.85	13	4.44	75	19.70
Informal relationship	29.5	5.04	—	32	5.31	18.5	4.93	13	3.35	60	11.38
Is it your current relationship?	—		−.14*	−.13*		—		—		—	

Extent	Emotional intelligence				Symbolic violence							
	Emotional perception		Emotional understanding		Internalized aspects		Interpersonal aspects		External aspects		Total symbolic violence	
	—		Mdn	STD	Mdn	STD						
Yes	—		27.5	6.91	33.5	10.04	—		—		—	
No	—		26	7.58	29	9.02	—		—		—	
Educational level	−.21**		—		—		—		—		—	
	Mdn	STD	—		—		—		—		—	
Completed secondary	31.5	5.22	—		—		—		—		—	
Complete university STDgree	25.5	6.42	—		—		—		—		—	
Incomplete university superior	22	2.89	—		—		—		—		—	
Complete technical superior	24	5.51	—		—		—		—		—	
Superior technical incomplete	22	2.89	—		—		—		—		—	
Postgraduate	21	6.38	—		—		—		—		—	
Religion	.14*		—		−.30**		−.16*		−.19**		−.19**	
	Mdn	STD	—		Mdn	STD	Mdn	STD	Mdn	STD	Mdn	STD
Catholic	26	6.64	—		35	9.40	19	6.53	14	4.14	68	17.21
Evangelical	26	8.39	—		41	9.80	24	4.06	14	2.28	79	13.37
Agnostic/atheist	30	6.7	—		34.5	8.57	17	3.99	16	4.75	58	12.83
Other	31	6.94	—		25	7.48	19.5	5.24	17	4.40	74	15.02

Note: N = 225. $^{*}p < .05$.
$^{**}p < .01$.

Table 2.
Correlations and Medians (Mdn) between emotional intelligence, symbolic violence and sociodemographic variables.

5. Discussion

First, to address the main objective of the investigation, we will discuss the relationship between EI and symbolic violence according to the theoretical review and the results of the present study. Then, we will revise the correlation between the constructs and the sociodemographic data to identify potential differences. Finally, we will address the limitations of the study and further suggestions for future research.

An inverse relationship was found between the emotional perception subscale and the interpersonal and internalized aspects subscales, as well as the total symbolic violence scale. The internalized aspects refer to socially assigned characteristics and obligations that are naturalized and subsequently considered as innate [5]. On the other hand, the interpersonal aspects include behaviors that are usually exhibited to avoid the questioning one's femininity or masculinity. Therefore, the results may be linked to the fact that women with high scores of emotional perception tend to look for more equitable relationships, and hence, do not grant significant importance to usually normalized inequalities [36].

So, it is observed that, despite the patriarchal organization of society, micro-level changes can be distinguished in the form of "patriarchal negotiations," in which women usually look for a greater sense of autonomy within the family unit [37, 38]. Therefore, it is suggested that women, whether consciously or unconsciously, develop different strategies that allow them to reach more equitable interactions in the context of a romantic relationship, prioritizing their own goals [39, 40]. It is stated in previous studies that women grant significant value to their autonomy and the equitable conditions in relationships give them a greater sense of satisfaction in that context [39, 41].

On the other hand, differences were found in the constructs chosen for the study according to sociodemographic data. In the first instance, regarding age, the adolescent participants scored higher in emotional perception, compared to the young and average adults. This does not coincide with previous research, which found a tendency for EI to increase with age [42–44]; however, other studies conducted with university students find that, rather, EI is maintained for a time without significant differences [45, 46]. Therefore, it is hypothesized that EI develops mainly in childhood and stabilizes in early adulthood [46]. The inverse occurred in relation to symbolic violence since the average adults reached the highest scores in the subscales of internalized and interpersonal aspects and in the total scale. This result is in line with what was found by Pecho-Ricaldi [5], who suggests that older people could have a less critical view regarding the naturalization of violence. The same thing can happen in the context of a couple relationship [1].

In addition, differences were found according to the sexual orientation of the participants. Thus, bisexual women showed higher scores of emotional perception and homosexual participants showed higher scores of symbolic violence on the subscales of internalized and interpersonal aspects and on the total scale. Regarding what was found about EI, it should be considered that the bisexual community goes through a series of negative experiences for not fitting into the categories of absolute homosexuality or heterosexuality [47, 48], such as the myth of bisexuality as a transition stage [49, 50]; social demand to establish a monogamous relationship that forces them to "choose" only one sex [51], among others.

Now, it is known that high levels of emotional perception have been related to emotional maladjustment, since monitoring one's own moods is not productive if its causes and consequences cannot be identified [52, 53]. Rather, a ruminative thinking

style is developed, which promotes repetitively giving great importance to negative feelings or thoughts [54]. Therefore, in this case, reaching high scores on this subscale may be poorly adaptive, since it would indicate that these women direct their attention to the experiences discussed, as well as the consequent stigmas they face in daily life, which may bring more negative experiences. On the other hand, to understand the scores on the scale of symbolic violence, it is important to consider that, for homosexual people, developing a positive sexual identity is a significant challenge given the social stigmas they face [55], which can be internalized [56, 57]. This would explain the scores in the dimensions, and in turn brings negative effects both on their personal development and that their relationships [58].

Contrary to other studies, no differences were found in the constructs according to the place of birth; however, variations were found according to the time of residence in Lima. Thus, those women who resided in Lima for up to 10 years showed lower levels of emotional understanding and higher scores of symbolic violence. This coincides with research carried out in the mountains, which indicates that gender-based violence is a common practice within marriage when women do not comply with the imposed roles, such as taking care of their partner and children or household chores [59, 60]. Regarding EI scores, Borja [61] points out that the greater the belief that the use of violence is allowed to defend honor, the lower emotional understanding scores are recorded. Thus, the results make sense if it is suggested that the participants with the longest residence time in the province show a tendency to naturalize the use of violence.

Regarding marital status, single participants showed higher scores in emotional perception, as opposed to the study by Borja [61] in which those who were in a relationship perceived their emotions better. In the case of married and cohabiting women, they had higher scores in symbolic violence (internalized, interpersonal, and total scale aspects), which coincides with other studies [5]. This can be explained because cohabiting women tend to accept social demands regarding their role as women [62], so they take on domestic tasks while the man is the "head of the household" [5]. In addition, it is also known that a possible separation is associated with the failure of their role as wives or mothers, so they can minimize or even deny possible negative characteristics of their relationship in order to fulfill the ideal [63]. Taking all this into account, it is hypothesized that cohabiting and married women, who therefore have a more traditional relationship, could minimize or ignore various expressions of violence in order to fulfill their role.

Likewise, differences were found in EI and symbolic violence depending on whether the participant had sons or daughters. Thus, those who did not have children had a greater emotional perception and lower levels on the subscales of internalized and interpersonal aspects, in addition to the total scale. Although motherhood is considered an essential characteristic of women and that which provides identity [64, 65], it also brings socially imposed obligations according to which women must put aside their own needs to attend to those of the minor; and if they do not achieve it, they are "not good enough" mothers [66]. For this reason, it is suggested that the participants without children should not comply with those demands, for which they allow themselves to give greater importance to their own emotions and feelings, in contrast to the mothers, who prioritize the experience of their children. Regarding symbolic violence, what was found coincides with the research by Valencia [62], in which women mothers achieved higher scores for it. Since mothers usually accept, teach, and reinforce certain behaviors in their sons and daughters to reaffirm their masculinity or femininity [67], it is hypothesized that the transmission of this discourse is the product of a previous internalization of such information.

Following this line, differences were also found according to the number of sons or daughters, as well as whether they were women or men. Like what has already been mentioned, women without children showed higher scores for emotional perception, and lower scores for symbolic violence, in the interpersonal and internalized aspects subscales and the total scale. However, although there are significant differences, there is no clear pattern in the dimension of external aspects, which refers to discourses about men and women normally transmitted by religion, the media, etc. [5]. The media is one of the most important ways of perpetuating the patriarchal system since it helps to promote moral codes, rules of beauty, and forms of success typical of this context [68, 69]. Thus, they often maintain beliefs regarding motherhood through sales and promotional commercials, where phrases such as "the most important thing for a woman is to be a mother", "life is worth it if you have children," etc. are common [70, 71]. In this way, the impact that the spread of these ideas can have can be appreciated.

Regarding whether the children are women or men, similar relationships to those already raised are found. Women who do not have children show higher levels of emotional perception, except in the case of the participant with three daughters, who obtained a higher score on said subscale, however, being a single case, this would not alter the trend found. On the other hand, on the symbolic violence scale, the mothers of one or up to three female daughters showed higher scores than those without daughters on the subscales of internalized and interpersonal aspects and on the total scale. Thus, considering those women with sons and daughters also show high levels of the same dimensions, it is necessary to reflect on a possible intergenerational transmission of violence and the possible implications that this has. For example, it's been reported that experiencing violence in the maternal home during someone's childhood and adolescence is a determinant factor of marital violence [72]. Following this line, it is known that, in the upbringing of girls, a traditional family model is usually taught and various gender roles are transmitted that place them in a secondary place [73]. Thus, it is likely that the participants have been exposed to various stereotypes from an early age, so this information would be internalized and later transmitted in the case of being mothers. On the other hand, similarly to what was previously studied, this pattern was not fulfilled in the external aspect's subscale.

In the case of having male children, those women with only one child showed higher scores in the subscales of internalized and interpersonal aspects and in the total scale of symbolic violence. In this way, it is argued that these participants internalized and transmitted to their sons' certain gender stereotypes that probably fit the model of "hegemonic masculinity", according to which, to be considered a man, he must meet a series of characteristics: be active and strong, not express emotions, be dominant, heterosexual, etc. [74–76]. Thus, from an early age, boys are part of a socialization process that facilitates the internalization of behaviors typical of a group that positions itself as superior and with authority over women [77, 78].

On the other hand, differences were also found in the dimensions of EI and symbolic violence according to the length of time they had been in a relationship. Those who were in a relationship of 6 months to 10 years showed higher levels of emotional perception. In contrast, this group obtained lower scores in the dimensions of internalized and interpersonal aspects and in the total scale of symbolic violence. This coincides with what was found by Valencia [62], since women in longer relationships showed greater internalization and normalization of gender roles since longer relationships have more traditional characteristics: children, marriage, etc. Likewise,

although he does not propose a specific age range, Borja [61] indicates that the most satisfied couples with a duration greater than 6 months present high scores in EI, specifically in emotional perception.

Regarding the type of relationship between the participants and their partners, it was found that cohabiting women had higher emotional perception scores, as well as in all dimensions of symbolic violence. As mentioned, this group usually accepts the socially imposed demands; for example, taking on household chores.

In relation to whether the participants referred to their current relationship during the survey, it was found that those who did, reached higher levels of emotional understanding, but also greater symbolic violence, specifically in the subscale of internalized aspects. In the first case, emotional understanding, which is vital to understand one's own and others' emotional states, as well as to integrate what one feels and thinks, has been related to partner satisfaction [61]. Thus, it is hypothesized that they are less likely to identify violence in a relationship with which they are satisfied. In the same way, symbolic aggression usually comes from a person from whom love is expected, so making it visible is complicated [79]. For example, it is observed that aggressions justified by jealousy are not perceived in such a negative way, as they are understood as an act of love [80].

Regarding the level of education, the participants with completed high school showed higher levels of emotional perception than those with a higher level of studies. The participants with these scores are between 18 and 22 years old, and most of them fit into the category of adolescents, who were the group with the highest emotional perception scores in the sample.

Differences were also found in the constructs according to the religion of the participants. Thus, those who identified themselves as atheists/agnostics or professed to have another relationship scored higher in emotional perception and in the dimension of external aspects on the scale of symbolic violence. The evangelical respondents showed higher scores of symbolic violence in the dimensions of internalized, interpersonal, and total scale aspects, like other research [5]. This may be related to the schemes proposed by religion, which indicate an ideal model to be followed by women, who are usually located at home [18]. In addition, it is known that "active participation in certain religions can reinforce sexist ideologies that legitimize gender inequality" ([81], p. 17).

In conclusion, the main objective of the study is partially verified, given that a relationship is found between some of the EI subscales and symbolic violence. The second hypothesis is also partially fulfilled since correlations between the concepts and the sociodemographic variables are identified. It should be noted that the research contributes to studies of symbolic violence, which have not been approached in depth by psychology, and is the first approach to its relationship with EI, something not previously studied and that contributes to the fight against gender violence.

On the other hand, the study had certain limitations, such as little diversity in the sample due to being shared on social networks, for which an Internet connection was necessary. In addition, the term "couple relationship" was interpreted according to the criteria of each participant, which could affect their answers. Finally, as a recommendation for future research, a qualitative approach to the subject is proposed, in order to collect more detailed information that allows supporting or questioning what was found. In addition, it would be important to increase the sample and reach lower SELs to reflect a larger part of the population. Likewise, it may be useful to consider the conditions in which women experience motherhood (whether it was desired or not, how it affects their life plan, etc.), as well as to reflect on the possible intergenerational transmission of violence. On the other hand, the approach of programs aimed at the prevention of gender violence based on EI is considered important.

Author details

Noelia Rodríguez-Espartal* and Daniela Ramírez Meneses
Psychology, Culture, and Gender Research Group, Pontifical Catholic University of Peru, San Miguel, Peru

*Address all correspondence to: nrodrigueze@pucp.edu.pe

IntechOpen

References

[1] Expósito F. Violencia de género. Mente y Cerebro. 2011;**48**(1):20-25

[2] Nieves R. Violencia de género: Un problema de Derechos Humanos. Comisión Económica para América Latina y el Caribe; 1996

[3] López-Nuñez M. La construcción de la masculinidad y su relación con la violencia de género. Revista Internacional de Trabajo Social y Ciencias Sociales. 2013;**5**:61-84. DOI: 10.5944/comunitania.5.4

[4] Organización Mundial de la Salud (8 de marzo de 2021). Violencia contra la mujer. Available from: https://www.who.int/es/news-room/fact-sheets/detail/violence-against-women

[5] Pecho-Ricaldi P. Sexismo ambivalente, pensamientos patriarcales y violencia simbólica inter e intra género en Lima y Huancayo [tesis de licenciatura, Pontificia Universidad Católica del Perú]. Repositorio Digital de Tesis y Trabajos de Investigación PUCP. 2017. Available from: http://hdl.handle.net/20.500.12404/9129

[6] Rodríguez-Espartal N. Intervención con presos por violencia de género. Propuesta y resultados de un programa basado en Inteligencia Emocional [tesis de doctorado, Universidad de Jaén]. Repositorio de la Universidad de Jaén; 2012

[7] Comisión Económica para América Latina y el Caribe (25 de noviembre de 2020). Feminicidio. Available from: https://oig.cepal.org/es/indicadores/feminicidio

[8] CNN Español (30 de diciembre de 2019). Perú alcanza cifra récord en feminicidios en una década: estos son los índices de feminicidios en América Latina en 2019. Available from: https://cnnespanol.cnn.com/2019/12/30/peru-alcanza-cifra-record-en-feminicidios-en-una-decada-estos-son-los-indices-de-feminicidios-en-america-latina-en-2019/

[9] Plan International (17 de enero de 2021). Conoce las estadísticas de violencia contra las mujeres durante la pandemia en:2021. Available from: https://www.planinternational.org.pe/blog/conoce-las-cifras-de-violencia-contra-las-mujeres-durante-la-pandemia

[10] Programa de las Naciones Unidas para el Desarrollo (PUND) (12 de abril de 2020). In: La otra pandemia: violencia en el hogar en tiempos de cuarentena. Available from: https://www.pe.undp.org/content/peru/es/home/presscenter/articles/2020/la-otra-pandemia--violencia-en-el-hogar-en-tiempos-de-cuarentena.html

[11] Defensoría del Pueblo. Defensoría del Pueblo: 519 mujeres desaparecidas y 18 feminicidios en enero. 2022. Available from: https://www.defensoria.gob.pe/defensoria-del-pueblo-519-mujeres-y-18-feminicidios-en-enero-2022/ [Accessed: 18 de marzo del 2022]

[12] Yugueros A. La violencia contra las mujeres: Conceptos y causas. Revista castellano-manchega de ciencias sociales. 2014;**18**:147-159. DOI: 10.20932/barataria.v0i18.49

[13] Organización de las Naciones Unidas. Declaración sobre la eliminación de la violencia contra las mujeres. Naciones Unidas; 1994

[14] Díaz-Aguado M, Arias R. La construcción de la igualdad y la prevención de la violencia contra la mujer desde la educación secundaria. In: Ministerio de Trabajo y Asuntos Sociales. Instituto de la Mujer; 2001

[15] Pinto A, Castro A, Delgado M, Ruiz A. Prevención de la violencia de género en el proceso formativo de la Universidad Técnica de Babahoyo. Dilemas Contemporáneos: Educación, Política y Valores. 2018;**12**:1-13

[16] Blanco J. Rostros visibles de la violencia invisible: Violencia simbólica que sostiene el patriarcado. Revista Venezolana de Estudios de la Mujer. 2009;**14**(32):63-70

[17] Bourdieu P. La Domination Masculine. Éditions du Seuil. 1998

[18] Bourdieu P. La Dominación Masculina. Editorial Anagrama. 2000

[19] Bourdieu P. Language and Symbolic Power. Harvard University Press; 1991

[20] Calderone M. Sobre violencia simbólica en Pierre Bourdieu. La trama de la Comunicación. 2004;**9**:59-65. DOI: 10.35305/lt.v9i0.172

[21] López S. La violencia simbólica en la construcción social del Género. Revista de Investigación en Ciencias Sociales y Humanidades. 2015;**2**(2)

[22] Acosta L. Violencia simbólica: Una estimación crítico-feminista del pensamiento de Pierre Bourdieu [tesis de doctorado, Universidad de la Laguna]. Repositorio Institucional de la Universidad de La Laguna. 2014. Available from: http://riull.ull.es/xmlui/handle/915/81

[23] Plaza-Velasco M. Sobre el concepto de "violencia de género". Violencia simbólica, lenguaje, representación. Revista electrónica de literatura comparada. 2007;**2**:132-145

[24] Bourdieu P. Intelectuales, política y poder. Eudeba; 2012

[25] Asakura H. ¿Ya superamos el" género"? Orden simbólico e identidad femenina. Estudios sociológicos. 2004; **22**(66): 719-743. Available from: http://www.jstor.org/stable/40420850

[26] Galtung J. Peace by Peaceful Means: Peace and Conflict, Development and Civilization. Sage. 1996;**14**

[27] Lorente M. Mi marido me pega lo normal. Agresión a la mujer: realidades y mitos. Planeta. 2001

[28] Ley 38.668 de. Sobre el Derecho de las Mujeres a una Vida Libre de Violencia. 23 de abril de 2007. Gaceta Oficial de la República Bolivariana de Venezuela 2007

[29] Lopez-Zafra, Rodríguez-Espartal N. Emociones. In: Sabucedo JM, Morales JF, editors. Psicología Social. Editorial Médica Panamericana; 2015

[30] Echeburúa E, Sarasúa B, Zubizarreta I, Corral P. Evaluación de la eficacia de un tratamiento cognitivo-conductual para hombres violentos contra la pareja en un marco comunitario: Una experiencia de 10 años (1997-2007). International Journal of Clinical and Health Psychology. 2009;**9**(2):199-217

[31] Vagi K, Rothman E, Latzman N, Tharp A, Hall D, Breiding M. Beyond correlates: A review of risk and protective factors for adolescent dating violence perpetration. Journal of Youth and Adolescence. 2013;**42**(4):633-649. DOI: 10.1007/s10964-013-9907-7

[32] Mayer J, Salovey P. What is emotional intelligence? In: Salovey P, Sluyter D, editors. Emotional Development and Emotional Intelligence: Educational Applications. Basic Books; 1997. pp. 3-31

[33] Chang M. Relación entre inteligencia emocional y respuesta al estrés en pacientes ambulatorios del servicio de psicología de una clínica de Lima Metropolitana [tesis de licenciatura, Universidad Peruana Cayetano Heredia].

Red de Repositorios Latinoamericanos. 2017. Available from: http://repositorioslatinoamericanos.uchile.cl/handle/2250/2501339

[34] Jiménez M. y López-Zafra E. Inteligencia emocional y rendimiento escolar: Estado actual de la cuestión. Revista Latinoamericana de Psicología. 2009;**41**(1):67-77

[35] Fernández-Berrocal P, Extremera N, y Ramos N. Validity and reliability of the Spanish modified version of the Trait Meta-Mood Scale. Psychological Reports. 2004;**94**:751-755

[36] Lopez-Zafra E, Berrios P, Augusto J. Introducción a la Psicología Social. Del Lunar; 2008

[37] Bastos, S. (1999). "Un "patrón de dominación patriarcal" único e inmutable?" En M. González de la Rocha (Ed.). Divergencias del modelo tradicional: Hogares de jefatura femenina en América Latina. 38-75. Centro de Investigaciones y Estudios Superiores en Antropología Social.

[38] Kandiyoti D. Bargaining with Patriarchy. Gender and Society. 1988;**2**(3):274-290. Available from: http://www.jstor.org/stable/190357

[39] Chacón-Onetto F, Tapia-Ladino M. No quiero tener hijos (as)… continuidad y cambio en las relaciones de pareja de mujeres profesionales jóvenes. Polis. 2017;**46**(16):193-220. Available from: http://journals.openedition.org/polis/12339

[40] Tapia M. Yo venía con un sueño. Relaciones de género entre inmigrantes de origen boliviano en Madrid 2000-2007 [tesis de doctorado, Universidad Complutense de Madrid]. Repositorio de la producción académica en abierto de la Universidad Complutense de Madrid; 2010

[41] Hernández-Martínez N, Alberti-Manzanares M, Núñez-Espinoza J, Samaniego-Villareal M. Relaciones de Género y Satisfacción Marital en comunidades rurales de Texcoco, Estado de México. Revista Internacional de Ciencias Sociales y Humanidades. 2017;**21**(1):39-64

[42] Mayer JD, Salovey P, Caruso D, Sitarenios G. Emotional intelligence as a standard intelligence. Emotion. 2001;**1**(3):232-242. DOI: 10.1037/1528-3542.1.3.232

[43] Mayer JD, Salovey P, Caruso D, Sitarenios G. Measuring emotional intelligence with the MSCEIT V 2.0. Emotion. 2003;**3**(1):97-105. DOI: 10.1037/1528-3542.3.1.97

[44] Van Rooy D, Viswesvaran C. Assesing emotional intelligence in adults: A review of the most popular measures. In: Bar-On R, Maree JG, Elias MG, editors. Educating People to be Emotionally Intelligent. 2007. pp. 259-272

[45] Fernández-Berrocal P, Extremera N, Ramos N. Validity and reliability of the Spanish modified version of the trait meta-mood scale. Psychological Reports. 2004;**94**(3):751-755. DOI: 10.2466/pr0.94.3.751-755

[46] Gohm CL, Clore GL. Affect as information: an individual differences approach. In: Barrett LF, Salovey P, editors. The wisdom in Feeling: Psychological Proceses in Emotional Intelligence. Guilford: el Publisher es Guilford, si está; 2002. pp. 89-113

[47] Esteban C, Toro-Alfonso J. ¿Es niño o niña? ¿Intersexual?: Introducción, problematización y recomendaciones para la psicología. Eureka. 2016;**13**(1):108-122

[48] Esteban C, Vázquez-Rivera M. La "B" que no se ve: Invisibilización desde los diagnósticos y desafíos para la

divulgación de la orientación sexual de hombres y mujeres bisexuales. Ciencias de la Conducta. 2014;**29**(1):41-62

[49] Esteban C. La "B" que se queda en el closet: Mitos, desafíos y la "salida del closet" de las personas bisexuales. Boletín Diversidad. 2014;**5**(1):7-9

[50] Mohr JJ, Weiner JL, Chopp RM, Wong SJ. Effects of client bisexuality on Clinical judgment: When is bias most likely to occur? Journal of Counseling Psychology. 2009;**56**(1):164-175. DOI: 10.1037/a0012816

[51] Vázquez-Rivera M. La "B" en terapia: Experiencias, modelos y asuntos particulares de la población bisexual en psicoterapia. Boletín Diversidad. 2014;**5**(1):12-15

[52] Fernández-Berrocal P, Extremera N. Inteligencia emocional percibida y diferencias individuales en el meta-conocimiento de los estados emocionales: Una revisión de los estudios con el TMMS. Ansiedad y Estrés. 2005;**11**(2):101-122

[53] Thayer J, Rossy L, Ruiz-Padial E, Johnsen B. Gender differences in the relationship between emotional regulation and depressive symptoms. Cognitive Therapy and Research. 2003;**27**(3):349-364. DOI: 10.1023/A:1023922618287

[54] Fernández-Berrocal P, Ramos N, y Extremera N. Inteligencia emocional, supresión crónica de pensamientos y ajuste psicológico. Boletín de psicología. 2001;**70**:79-95

[55] Pérez-Witch J. Identidad sexual y satisfacción de pareja en hombres heterosexuales de Lima Metropolitana [tesis de licenciatura, Pontificia Universidad Católica del Perú]. Repositorio Digital de Tesis y Trabajos de Investigación PUCP. 2017. Available from: http://hdl.handle.net/20.500.12404/9832

[56] Mohr JJ, Kendra MS. Revision and extension of a multidimensional scale measure of sexual minority identity: The Lesbian, Gay, and Bisexual Identity Scale. Journal of Counseling Psychology. 2011;**58**(2):234-245. DOI: 10.1037/a0022858

[57] Thies KE, Starks TJ, Denmark FL, Rosenthal L. Internalized homonegativity and relationship quality in same-sex romantic couples: A test of mental health mechanisms and gender moderator. Psychology of Sexual Orientation and Gender Diversity. 2016;**3**(3):325-335. DOI: 10.1037/sgd0000183

[58] Mereish EH, Poteat VP. A relational model of sexuality minority mental and physical health: The negative effects of shame on relationships, loneliness and health. Journal of Counseling Psychology. 2015;**62**(3):425-437. DOI: 10.1037/cou0000088

[59] Isla Y. Relaciones de poder en las parejas del AA. HH. La Victoria de El Tambo-Huancayo [tesis de maestría, Universidad Nacional del Centro del Perú]. Repositorio Institucional de la. Universidad Nacional del Centro del Perú; 2014

[60] Parra I. Tu casa es sangre: Relatos de mujeres sobre violencia familiar en la sierra central del Perú [tesis de doctorado, Universidad de Granada]. Repositorio Institucional de la Universidad de Granada. 2012. Available from: https://digibug.ugr.es/handle/10481/21635

[61] Borja J. Cultura del honor, inteligencia emocional y satisfacción de pareja en estudiantes de una escuela de oficiales de Lima Metropolitana [tesis de licenciatura, Pontificia Universidad Católica del Perú]. Repositorio Digital de Tesis y Trabajos de Investigación PUCP. 2019. Available from: http://hdl.handle.net/20.500.12404/14243

[62] Valencia A. Dependencia emocional y violencia simbólica en mujeres de Lima Metropolitana [tesis de licenciatura, Pontificia Universidad Católica del Perú]. Repositorio Digital de Tesis y Trabajos de Investigación PUCP. 2019. Available from: http://hdl.handle.net/20.500.12404/14999

[63] Castro I. La Pareja Actual: Transición y Cambios. Lugar Editorial; 2004

[64] Valverde K. y Cubero M. La maternidad como un constructo social determinante en el rol de la feminidad. Revista Wimb Lu. 2014;**9**(1):29-42. DOI: 10.15517/wl.v9i1.15248

[65] Yago T. Jóvenes, anticoncepción y género: Perspectiva de género en la práctica clínica. Universidad de Zarazoga; 2011

[66] Agudelo J, Bedoya J, Osorio D. Ser mujer: Entre la maternidad y la identidad. Revista Poiésis. 2016;**31**: 306-313. DOI: 10.21501/16920945.2121

[67] Lopez-Zafra E, Rodríguez-Espartal N, Ramoz-Alvarez M. Women's and men's role in culture of honor endorsement within families. European Journal of Women's Studies. 2019;**27**(1):72-88. DOI: 10.1177/1350506818824369

[68] Galarza E, Cobo R, Esquembre M. Medios y Violencia Simbólica contra las mujeres. Revista Latina de Comunicación Social. 2016;**71**:818-832. DOI: 10.4185/RLCS-2016-1122

[69] Sentamans T. Género, violencia simbólica y medios de comunicación. Crónicas dulces y masculinidad femenina en la prensa gráfica de la II República. Arte y políticas de identidad. 2012;**6**:231-247

[70] Tania E. Rocha-Sanchez & Rolando Díaz-Loving. Cultura de género: La brecha ideológica entre hombres y mujeres. Anales de Psicología 2005;**21**(1):42-49

[71] Mota-Gonzáles C, Calleja N, Sánchez-Bravo C, Carreño-Meléndez J. Escala de Creencias sobre la Maternidad: Construcción y Validación en mujeres mexicanas. Revista Iberoamericana de Diagnóstico y Evaluación. 2008;**50**(1): 163-172. DOI: 10.21865/RIDEP50.1.13

[72] Mora C. Madres e hijas maltratadas: La transmisión intergeneracional de la violencia doméstica en el Perú. GRADE. 2013

[73] Cieza K. Representaciones sociales de la maternidad de mujeres jóvenes de Lima. Antrhopologica. 2019;**37**(43):39-60. DOI: 10.18800/anthropologica.201902.002

[74] Connell R. La Organización Social de la Masculinidad. In: Valdés T, Olavarría J, editors. Masculinidad/es. Poder y Crisis. Isis Internacional; 1997. pp. 31-48

[75] Olavarría J. Y Todos Querían Ser (Buenos) Padres. FLACSO; 2001

[76] Olavarría J. y Valdés T. Ser Hombre en Santiago de Chile: a pesar de todo, un mismo modelo. En T. Valdés y J. Olavarría, editors. Masculinidades y Equidad de Género en América Latina; FLACSO; 1998. pp. 12-35

[77] Aguayo F, Kimelman E. Programa P Bolivia: Un manual para la paternidad activa. Padres y madres por una crianza positiva, compartida y sin violencia. Banco Interamericano de Desarrollo. 2016

[78] Ramos M. Manual de capacitación a líderes en masculinidades y prevención de la violencia basada en género. UNFPA; 2012

[79] Lascorz A. Violencia encubierta en las relaciones de pareja jóvenes [tesis de doctorado, Universidad de la Castilla-La Mancha]. Repositorio de la Universidad de la Castilla-La Mancha; 2015

[80] Perles F, San Martín J, Canto J, Moreno P. Inteligencia emocional, celos, tendencia al abuso y estrategias de resolución de conflicto en la pareja. Escritos de Psicología. 2011;**4**(1):34-43. DOI: 10.5231/psy.writ.2011.0605

[81] Parra del Pino, C.. La percepción de la cultura del honor en los residentes del Centro de Estancia Temporal de Inmigrantes de Melilla [tesis de Maestría, Universidad de Granada]. Repositorio Institucional de la Universidad de Granada. (2017). Available from: https://digibug.ugr.es/handle/10481/48442

Chapter 4

Perspective Chapter: Neuropsychology of Aggression in Psychopathy and Sociopathy – Insights for the Treatment and Study of Antisocial Personality Disorder

Zachary P. Pierce

Abstract

Misunderstanding, stigmatization, and fascination abound in western culture concerning the concepts of psychopathy and sociopathy. These concepts are often used interchangeably—and erroneously—to describe violent or aggressive behavior in humans. These concepts tend also to be hurled as insults at individuals assumed to exhibit a lack empathy, impulsive decision making, and violent behavior. Psychopathy and sociopathy, however, are two concepts that describe different etiologies of the same mental health condition: antisocial personality disorder. This chapter bifurcates between the neurobiological origins of psychopathy and sociopathy, contributing to the destigmatization of a broadly misunderstood mental health condition. This chapter also explores recent findings from functional magnetic resonance imagery studies that analyze neurophysiological activity germane to psychopathy and sociopathy. Using these terms, students, clinicians, and researchers have access to a language that outlines correlations in neural substrate activity between genetic antisocial personality disorder (psychopathy) and epigenetic antisocial personality disorder (sociopathy). These terms might also serve to enhance treatment outcomes, as they implicate discrete neural substrates that have the potential to be treated using psychotherapeutic and psychopharmacological interventions.

Keywords: aggression, ASPD, psychopathy, sociopathy, fMRI, brain

1. Introduction

Acts of aggression are often linked to and stigmatized alongside mental health conditions. Nowhere is this association more readily reflected than in violent portrayals of individuals who live with what is most likely antisocial personality disorder (ASPD). According to the *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition*

(DSM-5), ASPD is a Cluster B personality disorder (relating to unpredictable, erratic thinking and behavior) that implicates a pervasive pattern of physical aggression toward others (fights or assaults), a decreased capacity for remorse for harmful actions perpetrated against others, increased disregard for the safety of self and others, as well as lying or other deceitful behavior, among other symptoms. This constellation of symptoms is often represented in film, television, and literature through the figure of the "serial killer": An individual with homicidal impulses—often portrayed as more beast than human—who perpetrates egregious, patterned acts of murder, often with disturbing motivations, rituals, and other aspects related to the murders [1]. While these serial killers might exhibit symptoms like those outlined in the DSM-5 diagnosis of ASPD, these figures are more often identified by one of two words: a "psychopath" or a "sociopath" [2].

It is unclear how the terms psychopath and sociopath offer any helpful definition for conceptualizing the personalities, behaviors, thoughts, or feelings of these characters, let alone for real people. Definitions for these terms appear to attribute arbitrary characteristics that tend to overlap with one another, offering no clarifying criteria with which to meaningfully bifurcate between terms. Often individuals in the West tend to flippantly wield psychopath and sociopath as derogatory terms to lambast and otherize individuals whom they perceive as lacking empathy, perpetually lying, and or acting aggressively toward others [3]. Not only do media caricatures of "psychopaths" and "sociopaths" paint a grim, limiting picture for real people who live with ASPD, but the casual usage of these terms, with no meaningful distinction between them, obfuscates the real challenges that these individuals face. Indeed, acts of violence, among other things, tend show up more often as challenges for individuals living with ASPD [4], but not all individuals with ASPD experience the exact same series of challenges, for they are complex human beings with similarly complex motivations, much like the rest of humanity. Thus, how might aggression be more accurately reframed in the experience of ASPD? And how might the terms of sociopathy and psychopathy be rescued from the derisive public discourse to serve a helpful clinical purpose in this endeavor?

Accordingly, the present chapter of this book will utilize the framework of clinical neuropsychology—or the study of thoughts, feelings, and behaviors and their relationship to brain area activity [5, 6]—to guide this exploration of aggression, ASPD, psychopathy, and sociopathy. This framework not only provides a concrete scientific medium with which measure and observe the neurophysiological impacts of thoughts, feelings, and actions related to ASPD but also legitimizes the real physiological and behavioral challenges of individuals who live with this condition, destigmatizing the egregious bias against all individuals who live with ASPD as blood-thirsty, unfeeling criminals and killers [7]. Thus, within this framework, data from functional magnetic resonance imagery (fMRI) studies will be used to explore the activity of neural substrates implicated in aggression and ASPD. These data will be used to meaningfully differentiate the terms psychopathy and sociopathy, which have clinical significance with respect to the etiology of ASPD symptoms. Lastly this chapter will establish a jumping off point for mental health researchers and clinicians to better understand the neurophysiology and symptomatological etiology of ASPD, contributing helpfully to the process of destigmatization of a fundamentally misunderstood personality disorder.

2. What is aggression?

Before diving into the data and discussion of the neurophysiology of ASPD, it is important that terms are appropriately outlined and defined. First, what is meant by

"aggression?" One might hold certain assumptions about what aggression entails, some of which might be true, but not all of these assumptions are salient with respect to the experience of ASPD. For years researchers have been divided on how to define and conceptualize aggression. Indeed, it is universally accepted and empirically observable that there are multiple types of aggression [8]. Some leaders in the field promote a bivariate framework of aggression, others a multivariate framework [8, 9]; And then there are some who are conceptually agnostic about how to define aggression because presentations are often mixed [10]. Feshbach was among the first to utilize a bivariate model of aggression, outlining "proactive" and "reactive" subtypes [11]. There is also the work of Moyer who devised multivariate categories of different expressions of aggression from his research with animal populations [12]. The categories are as follows: *fear-induced aggression*—an act of aggression toward another animal when one feels cornered and unable to escape; *maternal aggression*—the mother acts aggressively toward a perceived source of threat to the safety of her young; *inter-male aggression*—males of the same species engage in aggressive behavior to compete for resources within a social dominance hierarchy (typically observed among chimpanzees and rodents) [13, 14]; *irritable aggression*—an aggression response to an irritating (whatever that means) stimulus in the environment; *sex-related aggression*—an act of aggression precipitated by a sexual act, typically observed in humans and some animal populations; *predatory aggression*—an aggression act distinct from others in this multivariate model, where an attack response is inspired by viewing an object of prey in line of sight, typically observed in predatory animal populations; and *territorial aggression*—also known as the resident-intruder paradigm in animal studies [15], this aggression response is triggered when one animal (the intruder) enters into the established territory of another animal (the resident). Recent research has expanded upon these complex expressions of aggression in animal subjects [16–18].

With respect to humans, defining aggression is not so simple. Human expressions of aggression often rely on a complex constellation of motivating factors—such as cultural context, experience of race, gender, and sexuality, political persuasion, religious sensibilities, etc.—and mechanisms—such as highly charged affect and strategic action planning. Territorial disputes between nation-states, for example, can involve acts of military-related aggression, but they can also involve complex affects germane to nationalistic beliefs that motivate behavior, and so on [8]. When defining human aggression, there are risks implicated in oversimplifying its phenomenology; namely, common expressions of aggression tend to categorically overlap and do not fall into discrete types, and bivariate models of human aggression do not conform to the complexities of what is known about the decision-making process [19]. Considering these caveats and complexities in the discourse, two definitions emerge that operationalize definitions about human aggression. The first definition comes from a study published in the 90s that stipulates interpersonal human aggression (or aggression between humans) as behaviors perpetrated from an intent to cause harm to someone who does not wish to be harmed [20]. While this definition leaves room for many exogenous factors to be considered, an assumption is made about the motivation of the aggressor, that there is an intent to cause harm. To be sure, causing harm can be extrapolated into a variety of environmental contexts with numerous motivating mechanisms, but there is another general category that summarizes the second half of human aggression: protection. Siegel and Victoroff, for example, propose "defensive rage behavior" as another definitional category through which to conceptualize the intent behind human aggression, where causing harm is of secondary concern to protection in the interaction [8]. Synthesizing these two definitions

of human aggression, therefore, one arrives at the following definition: *behaviors perpetrated from an intent to cause harm to someone who does not wish to be harmed, or from an intent to protect oneself from harm, where the motivation to cause harm is of secondary import*.

Taking this operationalized definition of human aggression, how might it be applied to aggression in the experience of ASPD? While motivations for acts of aggression can vary for individuals living with ASPD, motivations for these same individuals tend to cluster around impulse and premeditation [21]. Within the framework of the operationalized definition proposed in this, motivations for human aggression are accounted for among individuals living with ASPD. These individuals might be motivated to cause harm, whether by impulse or premeditation, and they might be driven to defend themselves, where the secondary harming behaviors could be impulsive or premeditated. It should be inferred, also, that these observations can be refined by complex exogenous factors that influence behavior and motivation.

3. What are sociopathy and psychopathy?

With a definition of aggression established and linked to the experience of ASPD, how might sociopathy and psychopathy factor into the discourse? The term psychopath was coined by a cohort of German psychiatrists in the late-1800s—of whom Dr. Julius Koch was a leading voice—to describe the personalities of individuals who appeared to spurn social expectations and desire to cause harm to others [22]. The influence of this term expanded throughout the early 20th century to describe individuals who violated legal and moral expectations placed upon residents of any given society [22]. Generally, speaking the colloquial use of psychopath carried with it an implicit stigma that these individuals are socially undesirable and thus deemed worthy of castigation. Concomitantly, an American psychologist by the name of Dr. George Partridge devised the term sociopathy to describe similar behavior phenomena to those observed by Koch in years past [23]. According to Partridge, sociopaths are individuals who broadly fail to live up to their community's established norms, and these behaviors pose a threat to the safety of other community members [23]. As has been discussed, psychopathy and sociopathy became popularized in media around the world from the mid-20th century onward and have moved into common parlance in the West to describe individuals who lie and who express any form of aggression toward others, especially when it is premeditated [1–3].

The definitions of psychopathy and sociopathy generated by Koch and Partridge, respectively, appear to refer to the same (or at least similar) constellation of behaviors. Unfortunately, the similarity in definitions obfuscates any meaningful difference between terms. And the definitional criteria themselves appear to be highly arbitrary. What exactly constitutes "causing harm to others" and "spurning social norms?" By these definitions, one might categorize a protestor as a psychopathy or sociopath. After all, their acts of protest presumably upset the status quo implicated in their present social norms, and the powers that be might perceive these acts of protest as an intent of the protestor to cause them harm. Does that mean the protestor is *truly* a psychopath or sociopath based on the virtue of protesting? Obviously not! And herein lies the lack of conceptual integrity (and absurdity) laden in Koch and Partridge's

definitions of psychopathy and sociopathy. This way of thinking about aggression and adherence to social norms perpetuates the systems of White Supremacy and anti-Black racism that are woven into the landscape of mental healthcare and social science research, among many other intersectional challenges [24].

Shifting away from these harmful models of aggression and other behaviors, the task is to helpfully redefine the terms of psychopathy and sociopathy in a way that 1) meaningfully differentiates between terms, 2) avoids arbitrary definitions of aggression and other behaviors, and 3) can be useful within clinical and research settings. Based on what is known about the behavioral challenges implicated in experiences of ASPD, aggression and other behaviors associated with psychopathy and sociopathy might find purchase in the context of this personality disorder; not in a derisive, stigmatizing sense but in a manner that is meaningful for clinical diagnosis and recovery. Therefore, to begin unpacking definitions of psychopathy and sociopathy with respect to ASPD, a brief discussion of neurobiological etiology is warranted.

3.1 Neurobiological etiology

For readers who are unfamiliar, neurobiology in humans implicates the study of cells and cellular network function in the nervous system, which informs cognitive, affective, and behavioral processes. For example, studies that addresses patterns of the release of cortisol during episodes of traumatic stress [25] or problems with serotonergic reuptake in cases of depression [26] are both examples of neurobiology. Neurobiology implicates, also, the study of genetics and epigenetics. Genetics involves the study of genes, gene variation, and heritable traits in organisms associated with DNA sequencing, whereas epigenetics implicates the study of heritable phenotype alterations that are not associated with DNA sequencing. In other words, the expression of epigenetic markers in the human body has the potential to change over time, often motivated by experiences in one's social environment; whereas genetic sequencing is heritable and not necessarily impacted by one's social environment [27].

Historically, sociopathy has been identified as an epigenetic phenomenon, developing because of chronic high stress situations that occur over one's lifetime [28]. For example, individuals who survive chronic child abuse have been shown to exhibit an increased expression of altered mRNA methylation markers over time, and these markers are correlated with an increase in antisocial symptomatology [28, 29]. And while there is no "psychopath gene," antisocial behaviors have been observed in individuals with no history of epigenetic stressors and alterations in certain genetic substrates, often figuring within multiple generations of families [30, 31]. In other words, research shows how ASPD has the potential to develop among individuals 1) who experience chronic adverse life situations during crucial developmental periods [32], or 2) whose family exhibits a history of the disorder [33]. Therefore, a meaningful difference between these two terms emerges: psychopathy is genetic, and sociopathy is epigenetic. And if one recalls the earlier discussion about sociopathy and psychopathy describing similar behaviors implicated in ASPD, it might be useful to conceptualize psychopathy and sociopathy as two different manifestations (or, perhaps, subtypes) of ASPD, differentiated, at least in part, by neurobiological etiology. While this framework might help explain the organic origins of sociopathy and psychopathy, is there evidence that these two ASPD subtypes exhibit different neurophysiology across the human lifespan? And if so, how do their neurophysiology impact expressions of aggression?

4. Aggression and the human brain

Before addressing the neurophysiology of the psychopathic and sociopathic subtypes of ASPD, it is worth circling back to the concept of human aggression and exploring how aggression manifests in the human brain. To frame this exploration of aggression in the human brain, it would be worthwhile to circle back to the definition for aggression offered in this chapter: *behaviors perpetrated from an intent to cause harm to someone who does not wish to be harmed, or from an intent to protect oneself from harm, where the motivation to cause harm is of secondary import*. From this definition, two key words emerge: intent and motivation. And with these key words, two driving forces for aggression emerge: causing harm and protecting oneself against harm. First, there are several regions of interest (ROIs) in the human brain associated with intent and motivation. The orbitofrontal cortex (OFC), for example, takes account of salience outcomes with respect to select social situations, or preferential attention to outcomes associated with the motivation task [34]. In other words, if someone is sitting in their living playing sudoku all while a news program is playing on the television, the OFC will activate and help this person direct their full attention to completing this puzzle while discriminating stimuli coming from the television. There is also the dorsolateral prefrontal cortex (dlPFC) which is responsible for cognitively organizing and executing plans for sensorimotor activity related to a motivation task, often co-activating the primary motor cortex (PMC) and the sensorimotor cortex (SMC) [34, 35]. For example, if someone is motivated to get up in the morning and go for a jog, the dlPFC will prepare the person to get out of bed, get dressed in workout clothes and running shoes, and then stretch in preparation for their jog. Additionally, the anterior cingulate cortex (ACC) activates during situations of motivation and intent by synthesizing attentional concerns and sensorimotor activity, appraising the costs and benefits of engaging in a motivation task [34–36]. Using the previous jogging example, the ACC will activate to help this individual assess whether it is worth it to go for a jog. The ACC might prompt this individual to consider how jogging will help them feel good and contribute to a health goal, or perhaps weigh out concerns about not having enough energy to commute to their place of work after they finish their jog. Lastly, there is the ventral tegmental area (VTA): A neuronal cluster located in the midbrain that is responsible for producing dopaminergic and serotonergic responses to motivation tasks, helping to reinforce these behaviors [37]. And while there are many other tangential and smaller ROIs implicated in the complex processes of motivation [34], the ROIs mentioned above present a general constellation of important regions correlated with motivation in humans.

These ROIs play crucial roles in the motivation or intent behind aggressive behavior. To illustrate these roles, consider the following story. Robert is going for a hike in the Rocky Mountains of Western Colorado. Halfway through his hike he stops to take a break and eat his lunch. Suddenly, Robert hears rustling in the bushes approximately 20 feet from his location. Then, a mountain lion emerges and begins growling at Robert, preparing to attack. While mountain lion attacks are incredibly rare, readers will observe in this example how Robert's brain springs into action to react to the threat posed by this mountain lion. At once, Robert's OFC helps him to focus his attention on the approaching mountain lion and ignore ostensibly irrelevant stimuli and environmental details around him. Simultaneously, Robert's dlPFC recruits is motor cortices to prepare him to stand up, shout at the mountain lion, and throw sticks and stones at it. Robert's ACC synthesizes this information and,

assessing the crucial motivation to preserve his life, decides to throw sticks and stones at the mountain lion in hopes of discouraging it from attacking further. Thankfully, Robert's strategy was a success. The mountain lion initially perceived Robert as a prey animal because he was sitting down eating his lunch. Once he stood up and acted aggressively, the mountain lion perceived Robert as a threat, not a prey animal, and ran away. Among the waves of relief that washed over Robert in the aftermath of this event, his VTA activated and flooded him with dopamine, reinforcing for Robert that acting aggressively and looking intimidating toward a mountain lion might be a useful skill, should he find himself in a similar situation in the future. Readers can assume that Robert's broader motivations for acting aggressively implicated a desire to protect himself against harm, as this mountain lion presented a considerable risk to his physical safety. All these ROIs, as well as countless others, worked together in the span of milliseconds to help Robert survive.

If one discusses aggressive behavior, they cannot ignore the fight or flight response. This behavioral response helps individuals prepare to fend off potential threats in the environment, including by means of acts of aggression. A crucial ROI system implicated in the fight or flight response is the limbic system. The limbic system is a subcortical midbrain network that helps individuals process emotional reactions to various environmental stimuli [38]. Particularly, the limbic system specializes in threat detection and prepares the body accordingly to respond to threat [39]. Two principal ROIs implicated in the limbic system's threat detection and response system are the amygdala and the hippocampus. About the size of a green pea, the amygdala is situated at the front of the limbic system and acts as the primary interface for emotional processing in the human body [40, 41]. The amygdala helps individuals process whether something in the environment is threat as well as complex networks of emotions related to motivation for action [41, 42]. The amygdala helps individuals process if they desire to act aggressively to protect themselves from potential harm (i.e., threat detection), cause harm (i.e., anger, disgust, jealousy, etc.), or some combination thereof [43]. With respect to the motivation to cause harm associated with the amygdala, consider an example of a person named Stacy who sees a fly buzzing around her living room. When Stacy sees this fly, her amygdala might not perceive it as a threat to safety but, instead, as a gross pest. Stacy's amygdala registers feelings of disgust and frustration toward the fly, and these feelings motivate Stacy to act aggressively toward the fly by swatting at it.

Working together with the amygdala in aggressive behavior is the hippocampus. Located behind the amygdala, the hippocampus serves as the primary center for short-term memory operationalization and long-term memory encoding in the human brain [44]. The hippocampus activates when retrieving memories that are associated with feelings processed by the amygdala in real time [45]. To situate these roles of the hippocampus in the context of aggression, consider once more the example of Stacy and the fly. When experiencing frustration and disgust at witnessing this fly buzzing around her living room, Stacy's hippocampus recalls a long-term memory from Stacy's childhood where a fly kept buzzing around her head as she laid on her bed in her bedroom. Stacy remembered that this previous experience with a fly really bothered her, recollecting similar feelings of disgust and frustration. This childhood memory helped prompt Stacy to swat at the fly buzzing around her living room. Thus, the hippocampus serves a crucial role toward accessing encoded memories associated with feelings expressed in the present moment, and these memories help reinforce behaviors associated with these feelings [46].

One might also include the insula as an important ROI implicated in aggressive behavior. Like the amygdala, the insula is a key emotion processing center in the human brain [47]. However, the insula also specializes in registering and processing both emotional and physical pain [47], as both types of pain are undifferentiated by the insula [48]. It has been studied for decades among human and animal subjects that the experience of pain can inspire acts of aggression for a variety of reasons, including protecting against further injury and pain, meting vengeance for a perceived slight, and so on [49]. The insula moderates sensations of pain in the human brain, which can lead to acts of aggression if other ROIs determine that the experience of pain is sufficient to warrant an aggressive response.

Lastly, there are the thalamus and brainstem which play key roles in moderating aggression and the human brain. The thalamus is an egg-shaped structure in the middle of the midbrain region which moderates afferent motor and sensory stimuli from the body to the brain [50]. On the converse, the brainstem is a small stalk-like structure connecting the brain the spinal column and is responsible for channeling efferent stimuli to moderate processes of the nervous system [51]. In effect, the thalamus and brainstem create "loop" of sorts to moderate input from various stimuli, helping the brain and body communicate and function accordingly [52]. This "loop" becomes particularly relevant when the fight or flight response is activated. When someone perceives an external threat in their environment and decides to act upon it by engaging in acts of aggression, the brainstem communicates to other areas of the central nervous system (CNS) that it is "time to fight." These areas of the CNS include the heart, lungs, major muscle and tendon groups, sweat glands, digestive tract, pancreas, and so on [53]. For example, the brainstem informs the heart pump more blood to the extremities; the lungs dilate to increase airflow and oxygenation; muscles and tendons tense up, reinforced from blood sent by the heart; the pancreas sends adrenaline throughout the body to energy the person before fighting; and much more. Accordingly, the thalamus and brainstem are crucial ROIS with respect to helping facilitate acts of aggression.

These ROIs mentioned above are observed to activate typically within most human beings during acts of aggression. The question remains, however, if these same ROIs activate in the same capacity among individuals who live with genetic ASPD (psychopathy) or epigenetic ASPD (sociopathy). Additionally, are there observable differences in neurophysiological activity between these ASPD subtypes? Thus, the following subsections of this chapter will compare extant findings for ROI activity among adults living with psychopathy and sociopathy, exploring crucial neurophysiological differences between each ASPD subtype. Children and adolescents will not be considered in this chapter's collection of findings to account for crucial neuroanatomical changes that occur during development. Findings from all studies in both subsections were collected using functional magnetic resonance imagery (fMRI).

4.1 Neural substrates correlated with psychopathy

Data for ROIs implicated in aggression for individuals living with psychopathy are represented in **Table 1** and organized by areas that are activated and deactivated during aggression. It is to be understood also that "activation" and "deactivation" to not implicate typical neurophysiological phenomena associated with aggression but disordered activation and deactivation of these ROIs to account for discrepancies in how individuals with ASPD respond to aggression stimuli in the environment versus

individuals without ASPD. The same principle applies also for data from the next subsection on sociopathy and aggression.

First, **Table 1** shows that individuals living with psychopathy often tend to exhibit disordered activation of the OFC [54, 55, 58, 59, 61, 62]. As has been discussed, the OFC typically activates when processing motivation to complete and repeat a motivation task [34]. In cases of psychopathy, the OFC appears to activate in a typical fashion, but the activation responses are to atypical reward tasks, often tasks that contrast from values in the individual's cultural context [63]. Thus, the neurological circuitry of OFC itself is not inhibited nor impaired but is disordered by the response impulses it receives from other ROIs. Thus, if other areas of the brain inform someone to crash a car or steal someone's belongings, the OFC will process these behavioral stimuli without moderation that typically occurs in OFC function.

Principally, the OFC is informed by the medial prefrontal cortex (mPFC), which figures often as an area of disordered activation [54–57, 60, 61]. The mPFC is responsible for action planning, impulse control, social/moral behavior, relationship building, problem solving, and other functions, similarly to the dlPFC described earlier [64]. For individuals with psychopathy, however, the mPFC appears to play a key role in how they process relationships, impulse control, and social/moral behavior, which then informs the habituation of behavior through the OFC [65]. There appears to be a marked volumetric difference in mPFC size among individuals living with psychopathy versus those who do not ($p < .004$ Bonferroni correction) [66]. It has also been observed among those living with psychopathy that the mPFC appears to exhibit less functional connectivity between other social/moral behavior and emotion processing centers in the brain [67]. Thus, when translated to contexts of aggression for those living with psychopathy, the mPFC activates consistently but exhibits challenges in sending crucial impulses to trigger empathetic emotional responses, moderate behavioral impulses, and cognitively reflect on motivations for actions. Using the previous example of a person stealing someone's belongings, an individual with psychopathy might have considerable challenges processing how the other person might feel if they stole their belongings, moderating the impulse to commit theft in the first place, and ultimately reflect on the motivation for stealing belongings in the first place. Thus, individuals who live with psychopathy, though they might engage in

Sources	Brain area activation	Brain area deactivation
Anderson and Kiehl [54]	OFC, mPFC, and ACC	Amygdala
Blair [55]	OFC, mPFC, and ACC	Amygdala
Glen and Raine [56]	mPFC and ACC	Amygdala
Harenski and Kiehl [57]	mPFC	Amygdala
Lam et al. [58]	OFC	
Nummenmaa et al. [59]	OFC, ACC, PMC	Insula and amygdala
Patrick [60]	ACC and mPFC	Amygdala
Perez [61]	OFC and mPFC	
Schiffer et al. [62]	ACC and OFC	Insula and amygdala

Note: OFC = orbitofrontal cortex; mPFC = medial prefrontal cortex; ACC = anterior cingulate cortex; and PMC = primary motor cortex.

Table 1.
Brain area activity during aggression in psychopathy.

behaviors perceived as egregious or even heinous in certain cultural contexts, are not sub-human monsters, volitionally devoid of moral character. Rather, they are human beings living with the impacts of a genetically disordered mPFC that does not connect properly to crucial ROIs implicated in various prosocial behaviors.

Lastly, **Table 1** shows a marked deactivation of the amygdala among individuals who live with psychopathy [54–57, 59, 60, 62]. Ordinarily, the amygdala activates in response to threat stimuli in the environment, signaling that the individual should either prepare to fight or run away [40, 41]. For individuals living with psychopathy, however, the amygdala often deactivates when encountering threat stimuli in the environment. This phenomenon is explained in part by decreased functional connectivity of the amygdala with other ROIs, indicating a [decreased capacity for] "contextual fear conditioning, and insensitivity to cues predicting capture" [54]. Deactivation of the amygdala during acts of aggression among individuals living with psychopathy correlates to a lack of stimulation of the thalamus and brainstem, which do not prompt the CNS to activate crucial survival regions in the human body when engaging in acts of aggression [68]. However, on the occasions when the amygdala does activate, it usually occurs during very high stress situations, which often lead to a decreased capacity for amygdalar affective downregulation [54–56]. Thus, individuals who live with psychopathy appear not to respond to aggression stimuli in the environment out of fear or a need to survive, as their amygdalae typically deactivate. However, the motivation to engage in acts of aggression appears to come from their social and moral reasoning, which often does not implicate prosocial reasoning and behavior. Thus, individuals who live with psychopathy appear to engage in acts of aggression because they are human beings who exhibit genetically altered neurophysiological activity in their amygdalae, activity which is often reflected in antisocial behaviors.

4.2 Neural substrates correlated with sociopathy

Data for ROIs implicated in aggression for individuals living with sociopathy are represented in **Table 2** and organized by areas that are activated and deactivated during aggression. In contrast to psychopathy, which is a genetic form of ASPD, sociopathy is an epigenetic form of ASPD, developed primarily by environmental factors that the individual encounters. Thus, at birth, individuals with sociopathy do not tend to exhibit any noticeable neurophysiological differences [78]. Once they encounter major or persistent stressors, like chronic child abuse or community violence, then ROIs begin exhibit disordered activation which could lead to ASPD [79]. Across all data in **Table 2**, individuals living with sociopathy tend to exhibit similar activation and functional connectivity issues with the OFC and mPFC to those living with psychopathy [69–77]. Like in psychopathy, individual living with sociopathy tend to process behavioral stimuli in their OFC in a typical manner, but these inputs are coming from disordered social and moral reasoning and decreased capacity for impulse exhibited by the mPFC [69, 70, 80]. Thus, when considering these specific cognitive functions and behaviors related to aggression, individuals living with sociopathy and psychopathy are virtually indistinguishable.

The primary difference in presentations of sociopathy and aggression, however, come with amygdala activity. According to data in **Table 2**, individuals living with sociopathy appear to exhibit consistent amygdala activation when engaging in acts of aggression [70–77]. In contrast to psychopathy, individuals living with sociopathy appear to exhibit more functional connectivity between the amygdala, thalamus,

Sources	Brain area activation	Brain area deactivation
Blair and Cipolotti [69]	Amygdala, OFC	
Bower and Price [70]	mPFC, OFC, amygdala	
Cipriani et al. [71]	mPFC, OFC, amygdala	
Damasio et al. [72]	mPFC, amygdala	
de Oliveira-Souza et al. [73]	mPFC, amygdala	
Gregory et al. [74]	mPFC, amygdala, insula	
Mendez et al. [75]	OFC, mPFC, amygdala	
Mendez et al. [76]	OFC, mPFC, amygdala	
Tang et al. [77]	ACC, mPFC, OFC, amygdala	

Note: OFC = orbitofrontal cortex; mPFC = medial prefrontal cortex; and ACC = anterior cingulate cortex.

Table 2.
Brain area activity during aggression in sociopathy.

brainstem, and thus the CNS [81]. Individuals with sociopathy appear to respond in more typical fashion to fear and threat stimuli in the environment [82]. To be sure, when compared with individuals living with psychopathy, individuals living with sociopathy exhibited a consistently higher emotional response rate to threat and fear stimuli ($p < .001$) [83]. Thus, a key difference between sociopathy and psychopathy appears to be the nature in which the amygdala activates. However, in the context of sociopathy, amygdala activation correlates only with fear and threat stimuli but not with moral reasoning dependent on cultural values, which is indicated by functional connectivity issues in the mPFC, like those exhibited by individuals living with psychopathy. Accordingly, these data can lead readers to infer that individuals who live with sociopathy appear to engage in acts of aggression due to differential and disordered activation of key ROIs implicated in aggressive behavior.

5. Implications for mental healthcare clinicians and researchers

Findings from this chapter present several implications for mental healthcare clinicians and researchers. First, this chapter categorizes psychopathy and sociopathy as two subtypes of ASPD, one forming genetically (psychopathy) and the other forming epigenetically (sociopathy). This categorization aims to destigmatize the experience of ASPD during clinical work as individuals with ASPD are often castigated as "heartless" or "inhuman" [7]. To be sure, categorizing psychopathy and sociopathy in this way does not make any less egregious the actions that these individuals might have committed, nor render them any less culpable in a court of law for crimes committed. Rather, this categorization helps to engender compassion for these individuals as human beings who live with a challenging and often misunderstood personality disorder.

Additionally, this genetic and epigenetic differentiation could be used as helpful criteria for determining which type of treatment to use in a therapeutic context. Referring to data from **Tables 1** and **2**, individuals living with psychopathy appear to exhibit amygdala deactivation during acts of aggression, whereas individuals living with sociopathy tend to exhibit consistent activation and functional connectivity.

Therapeutically speaking, individuals as having the psychopathy subtype might benefit from interventions that help build fluency with emotional fluency and moral reasoning. For example, clinicians might utilize interventions such as schema therapy (ST) or psychodynamic psychotherapy (PD). ST is a well-studied cognitive therapy that has been indicated for successful long-term use with individuals living with personality disorders [84]. ST helps individuals identify and restructure cognitive schemas associated with unhelpful beliefs, thoughts, emotions, and actions [84]. Additionally, PD is a therapy derived from psychoanalysis that is insight-oriented and invites clients to explore emotional distress through developing skills in self-exploration and self-reflection [85, 86] PD in its short-term iteration has also been indicated for successful treatment for individuals living with ASPD, as it encourages individuals to explore and challenge motivations for tasks associated with aggressive behavior [86, 87]. Either of these interventions might provide some beneficial results for individuals living with psychopathy who seek treatment. For individuals living with sociopathy, an alternative approach to treatment could involve utilizing mentalization-based therapy (MBT). MBT is long-term, manualize, composite psychotherapy that utilizes psychodynamic, cognitive, and ecological aspects to aid individuals with the process of metacognition [88]. MBT has been indicated for use with individuals live with personality disorders and struggle with challenges germane to affect regulation [89]. MBT has the potential to aid individuals living with the sociopathy subtype to reconceptualize their motivations for aggressive behavior, learn effective affect regulation skills, and address cognitive challenges with respect to moral reasoning and affect identification [89]. With this model and these findings, individuals living with psychopathy and sociopathy might receive more suitable treatment that addresses ROIs implicated in their individual mental health conditions.

With respect to researchers, findings from this chapter prompt further investigation into key differences between sociopathy and psychopathy. Namely, further study is warranted concerning differences in amygdala activation and deactivation between sociopathy and psychopathy [90]. Further evidence in this domain could lead to increased understanding in the specific amygdalar mechanisms that are implicated in each mental health condition. Additionally, further study is needed on the role of mPFC in presentations of psychopathy and sociopathy to determine why exactly these functional connectivity deficits correlate with challenges in emotional fluency and social/moral reasoning. Lastly, further study on ACC activity in psychopathy and sociopathy would help increase understanding of the synthesis between cognitive processes and moral reasoning for these individuals. Indeed, further ACC research in this domain could help unravel questions relation to social/moral reasoning challenges associated with frontal lobe regions in the brains of individuals living with sociopathy and psychopathy. With all things considered, this chapter offers helpful considerations for both mental healthcare clinicians and researchers to re-envision ASPD as well as psychopathy and sociopathy, opening tantalizing channels for innovative therapeutic care and groundbreaking research.

6. Conclusion

This chapter explored differences between psychopathy and sociopathy using a neuropsychological perspective, considering differences in neurophysiology and neurobiology with respect to psychological and behavioral phenomena. This chapter offered a definition of aggression in human beings: *behaviors perpetrated from an*

intent to cause harm to someone who does not wish to be harmed, or from an intent to protect oneself from harm, where the motivation to cause harm is of secondary import. It has been shown how individuals who live with ASPD often exhibit aggression utilizing both general aspects of this definition. Additionally, this chapter has discussed how ASPD—and aggressive behaviors exhibited therewith—have the potential to develop both genetically and epigenetically, the phenomenology of which is defined by psychopathy and sociopathy, respectively. This chapter included a discussion about how aggression manifests neurophysiologically and identified key ROIs implicated in aggressive behavior. Data was then collated and presented to distinguish neurophysiological activity between individuals living with psychopathy and sociopathy. This chapter identified that there are similar patterns of disordered activation of the mPFC and OFC individuals living with psychopathy and sociopathy. However, a key difference between both ASPD subtypes was indicated by differences in amygdalar activity; namely, individuals living with psychopathy tended to exhibit amygdala deactivation during acts of aggression, while individuals living with sociopathy tended to exhibit consistent amygdala activation and functional connectivity. These neurophysiological differences explained behavioral differences as well. Individuals living with psychopathy tended to engage in acts of aggression because of motivation from their social/moral reasoning, whereas individuals living with sociopathy tended to engage in acts of aggression in response to typical threat and fear cues in the environment. Findings from this chapter hold several key implications for clinical work and research, including distinguishing modes of treatment for individuals living with these different ASPD subtypes and exploring further how and why each ROI impacted by these conditions contributes to their symptomatology. Overall, however, this chapter presents a fresh perspective on ASPD, psychopathy, and sociopathy, humanizing the individuals living with these conditions, and encouraging innovation in mental health treatment and research for the future.

Author details

Zachary P. Pierce
Boston College School of Social Work, Chestnut Hill, MA, USA

*Address all correspondence to: pierceza@bc.edu

References

[1] Wiest JB. Casting cultural monsters: Representations of serial killers in U.S. and U.K. news media. Howard Journal of Communications. 2016;**4**:327-346. DOI: 10.180/10646175.2016.1202876

[2] Kircaburun K, Griffiths MD. The dark side of internet: Preliminary evidence for the associations of dark personality traits with specific online activities and problematic internet use. Journal of Behavioral Addictions. 2018;**7**:993-1003. DOI: 10.1556/2006.7.2018.109

[3] Sanz-García A, Gesteira C, Sanz J, García-Vera MP. Prevalence of psychopathy in the general adult population: A systematic review and meta-analysis. Frontiers in Psychology. 2021;**12**:1-13. DOI: 10.3389/fpsyg.2021.661044

[4] Filov I. Antisocial personality traits as a risk factor of violence between individuals with mental disorders. Open Access Macedonian Journal of Medical Sciences. 2019;**7**:657-662. DOI: 10.3889/oamjms.2019.146

[5] Lane S, Kjome KL, Moeller FG. Neuropsychiatry of aggression. Neurologic Clinics. 2011;**29**:49-vii. DOI: 10.1016/j.ncl.2010.10.006

[6] Siever LJ. Neurobiology of aggression and violence. American Journal of Psychiatry. 2008;**165**:429-442. DOI: 10.1176/appi.ajp.2008.07111774

[7] Chukhrii I, Zaplatynska A, Komar T, Melnyk Y, Liesnichenko N, Nemash L. Neuropsychological approach to the problem of aggressive manifestations of personality. Brain. 2021;**12**:11-24. DOI: 10.18662/brain/12.3/217

[8] Siegel A, Victoroff J. Understanding human aggression: New insights from neuroscience. International Journal of Law and Psychiatry. 2009;**32**:209-215. DOI: 10.1016/k.ijlp.2009.06.001

[9] Denson TF. The multiple systems model of angry rumination. Personality and Social Psychology Review. 2013;**17**:103-123. DOI: 10.1177/1088868312467086

[10] Denson TF, O'Dean SM, Blake KR, Beames JR. Aggression in women: Behavior, brain, and hormones. Frontiers in Behavioral Neuroscience. 2018;**12**:1-20. DOI: 10.3389/fnbeh.2018.00081

[11] Feshbach S. The function of aggression and the regulation of aggressive drive. Psychological Review. 1964;**71**:257-272

[12] Moyer KE. Kinds of aggression and their physiological basis. Communications in Behavioral Biology. 1968;**2**:65-87

[13] Wrangham RW, Glowacki L. Intergroup aggression in chimpanzees and war in nomadic hunter-gatherers. Human Nature. 2012;**23**:5-29. DOI: 10.1007/s12110-012-9132-1

[14] Lidster K, Owen K, Browne WJ, Prescott MJ. Cage aggression in group-housed laboratory male mice: An international data crowdsourcing project. Scientific Reports. 2019;**9**:1-12. DOI: 10.1038/s41598-019-51674-z

[15] Koolhaas JM, Coppens CM, de Boer SF, Buwalda B, Meerlo P, Timmermans PJA. The resident-intruder paradigm: A standardized test for aggression, violence, and social stress. Journal of Visualized Experiments. 2013;**77**:1-7. DOI: 10.3791/4367

[16] Golden SA, Jin M, Shaham Y. Animal models of (or for) aggression reward, addiction, and relapse: Behavior and circuits. The Journal of Neuroscience. 2019;**39**:2996-4008. DOI: 10.1523/JNEUROSCI.0151-19.2019

[17] Mikkola S, Salonen M, Puurunen J, Hakanen E, Sulkama S, Araujo C, et al. Aggressive behaviour is affected by demographic, environmental, and behavioural factors in purebred dogs. Scientific Reports. 2021;**11**:1-10. DOI: 10.1038/s41598-021-88793-5

[18] Kleszcz A, Cholewińska P, Front G, Pacoń J, Bodkowski R, Janczak M, et al. Review of selected aggression causes and the role of neurocognitive science in the diagnosis. Animals. 2022;**12**:1-15. DOI: 10.3390/ani12030281

[19] Anderson CA, Carnagey NL. Violent evil and the general aggression model. In: Miller AG, editor. The Social Psychology of Good and Evil. New York: Guilford; 2004. pp. 168-192

[20] Baron RA, Richardson DR. Human Aggression. 2nd ed. Plenum Press; 1994

[21] Azevedo J, Vieira-Coelho M, Castelo-Branco M, Coelho R, Figueiredo-Braga M. Impulsive and premeditated aggression in male offenders with antisocial personality disorder. PLoS One. 2020;**15**:1-18. DOI: 10.1371/journal.pone.0229876

[22] Eghigian GA. Drifting concept for an unruly menace: A history of psychopathy in Germany. Isis. 2015;**106**:283-309. DOI: 10.1086/681994

[23] Black DW. The natural history of antisocial personality disorder. Canadian Journal of Psychiatry. 2015;**60**:309-314. DOI: 10.1177/070674371506000703

[24] Bourabain D, Verhaeghe P-P. Everyday racism in social science research: A systematic review and future directions. Du Bois Review. 2021;**18**:221-250. DOI: 10.1017/S1742058X21000102

[25] Pan X, Wang Z, Wu X, Wen SW, Liu A. Salivary cortisol in post-traumatic stress disorder: A systematic review and meta-analysis. BMC Psychiatry. 2018;**18**:1-10. DOI: 10.1186/s12888-018-1910-9

[26] Dean J, Keshavan M. The neurobiology of depression: An integrated view. Asian Journal of Psychiatry. 2017;**27**:101-111. DOI: 10.1016/j.ajp.2017.01.025

[27] Cavalli G, Heard E. Advances in epigenetics link genetics to the environment and disease. Nature. 2019;**571**:489-499. DOI: 10.1038/s41586-019-1411-0

[28] Gillett G, Tamatea AJ. The warrior gene: Epigenetic considerations. New Genetics and Society. 2012;**31**:41-53. DOI: 10.1080/14636778.2011.597982

[29] Gescher DM, Kahl KG, Hillemacher T, Frieling H, Kuhn J, Frodl T. Epigenetics in personality disorders: Today's insights. Frontiers in Psychiatry. 2018;**19**:1-20. DOI: 10.3389/fpsyt.2018.00579

[30] Tiihonen J, Koskuvi M, Lähteenvuo M, Virtanen PLJ, Ojansuu I, Vaurio O, et al. Neurobiological roots of psychopathy. Molecular Psychiatry. 2020;**25**:3432-3441. DOI: 10.1038/s41380-019-0488-z

[31] Rautiainen M-R, Paunio T, Repo-Tiihonen E, Virkkunen M, Ollila HM, Sulkava S, et al. Genome-wide association study of antisocial personality disorder. Translational Psychiatry. 2016;**6**:1-10. DOI: 10.1038/tp.2016.155

[32] Kolla NJ, Vinette SA. Monoamine oxidase a in antisocial personality disorder and borderline personality disorder. Current Behavioral Neuroscience Reports. 2017;**4**:41-48. DOI: 10.1007/s40473-017-0102-0

[33] Friedman NP, Rhee SH, Ross JM, Corley RP, Hewitt JK. Genetic and environmental relations of executive functions to antisocial personality disorder symptoms and psychopathy. International Journal of Psychophysiology. 2021;**163**:67-78. DOI: 10.1016/j.ijpsycho.2018.12.007

[34] O'Reilly RC. Unraveling the mysteries of motivation. Trends in Cognitive Sciences. 2020;**24**:425-434. DOI: 10.106/j.tics.2020.03.001

[35] Berkman ET. The neuroscience of goals and behavior change. Consulting Psychology Journal: Practice and Research. 2018;**70**:28-44. DOI: 10.1037/cpb0000094

[36] Kim S-I. Neuroscientific model of motivational process. Frontiers in Psychology. 2013;**4**:1-12. DOI: 10.3389/fpsyg.2013.00098

[37] Kalivas PW. Neurotransmitter regulation of dopamine neurons in the ventral tegmental area. Brain Research Reviews. 1993;**18**:75-113. DOI: 10.1016/0165-0173(93)90008-N

[38] Sokolowski K, Corbin JG. Wired for behaviors: From development to function of innate limbic system circuitry. Frontiers in Molecular Neuroscience. 2012;**5**:1-15. DOI: 10.3389/fnmol.2012.00055

[39] Mujica-Parodi LR, Cha J, Gao J. From anxious to reckless: A control systems approach unifies prefrontal-limbic regulation across the spectrum of threat detection. Frontiers in Systems Neuroscience. 2017;**11**:1-14. DOI: 10.3389/fnsys.2017.00018

[40] Davis M, Whalen PJ. The amygdala: Vigilance and emotion. Molecular Psychiatry. 2001;**6**:13-34. DOI: 10.1038/sj.mp.4000812

[41] Ressler KJ. Amygdala activity, fear, and anxiety: Modulation by stress. Biological Psychiatry. 2010;**67**:1117-1119. DOI: 10.1016/j.biopsych.2010.04.027

[42] Siep N, Tonnaer F, van de Ven V, Arntz A, Raine A, Cima M. Anger provocation increases limbic and decreases medial prefrontal cortex connectivity with the left amygdala in reactive aggressive violent offenders. Brain Imaging and Behavior. 2019;**13**:1311-1323. DOI: 10.1007/s11682-018-9945-6

[43] Matthies S, Rüsch N, Weber M, Lieb K, Philipsen A, Tuescher O, et al. Small amygdala—High aggression? The role of the amygdala in modulating aggression in healthy subjects. The World Journal of Biological Psychiatry. 2012;**13**:75-81. DOI: 10.3109/15622975.2010.541282

[44] Lisman J, Buzsáki G, Eichenbaum H, Nadel L, Ranganath C, Redish AD. Viewpoints: How the hippocampus contributes to memory, navigation, and cognition. Nature Neuroscience. 2017;**20**:1434-1447. DOI: 10.1038/nn.4661

[45] Jin J, Maren S. Prefrontal-hippocampal interactions in memory and emotion. Frontiers in Systems Neuroscience. 2015;**9**:1-8. DOI: 10.3389/fnsys.2015.00170

[46] Zhu Y, Gao H, Tong L, Li ZL, Wang L, Zhang C, et al. Emotion regulation of hippocampus using real-time fMRI neurofeedback in healthy human. Frontiers in Human

Neuroscience. 2019;**13**:1-14. DOI: 10.3389/fnhum.2019.00242

[47] Uddin LQ, Nomi JS, Herbert-Seropian B, Ghaziri J, Boucher O. Structure and function of the human insula. Journal of Clinical Neurophysiology. 2017;**34**:300-306. DOI: 10.1097/WNP.0000000000000377

[48] Orenius TI, Raij TT, Nuortimo A, Näätänen P, Lipsanen J, Karlsson H. The interaction of emotion and pain in the insula and secondary somatosensory cortex. The Journal of Neuroscience. 2017;**4**:185-194. DOI: 10.1016/j.neuroscience.2017.02.047

[49] Berkowitz L. Pain and aggression: Some findings and implications. Motivation and Emotion. 1993;**17**:277-293. DOI: 10.1007/BF00992223

[50] Hwang K, Bertolero MA, Liu WB, D'Esposito M. The human thalamus is an integrative hub for functional brain networks. The Journal of Neuroscience. 2017;**37**:5594-5607. DOI: 10.1523/JNEUROSCI.0067-17.2017

[51] Nicholls JG, Paton JFR. Brainstem: Neural networks vital for life. Philosophical Transactions of the Royal Society of London B. 2009;**364**:2447-2451. DOI: 10.1098/rstb.2009.0064

[52] Venkatraman A, Edlow BL, Immordino-Yang MH. The brainstem in emotion: A review. Frontiers in Neuroanatomy. 2017;**11**:1-12. DOI: 10.3389/fnana.2017.00015

[53] Godoy LD, Rossignoli MT, Delfino-Pereira P, Garcia-Cairasco N, de Lima UEH. A comprehensive overview on stress neurobiology: Basic concepts and clinical implications. Frontiers in Behavioral Neuroscience. 2018;**12**:1-23. DOI: 10.3389/fnbeh.2018.00127

[54] Anderson NE, Kiehl KA. Psychopathy & aggression: When paralimbic dysfunction leads to violence. Current Topics in Behavioral Neuroscience. 2014;**17**:369-393. DOI: 10.1007/7854_2013_257

[55] Blair RJR. Neurocognitive models of aggression, the antisocial personality disorders, and psychopathy. Journal of Neurology, Neurosurgery, and Psychiatry. 2001;**71**:727-731. DOI: 10.1136/jnnp.71.6.727

[56] Glenn AL, Raine A. Psychopathy and instrumental aggression: Evolutionary, neurobiological, and legal perspectives. International Journal of Law and Psychiatry. 2009;**32**:253-258. DOI: 10.1016/j.ijlp.2009.04.002

[57] Harenski CL, Kiehl KA. Reactive aggression in psychopathy and the role of frustration: Susceptibility, experience, and control. British Journal of Psychology. 2010;**101**:401-406. DOI: 10.1348/000712609X471067

[58] Lam BYH, Yang Y, Schug RA, Han C, Liu J, Lee TMC. Psychopathy moderates the relationship between the orbitofrontal and striatal alterations and violence: The investigation of individuals accused of homicide. Frontiers in Human Neuroscience. 2017;**11**:1-11. DOI: 10.3389/fnhum.2017.00579

[59] Nummenmaa L, Lukkarinen L, Sun L, Putkinen V, Seppälä K, Karjalainen T, et al. Brain basis of psychopathy in criminal offenders and general population. Cerebral Cortex. 2021;**31**:4104-4114. DOI: 10.1093/cercor/bhab072

[60] Patrick CJ. Physiological correlates of psychopathy, antisocial personality disorder, habitual aggression, and violence. Current Topics in Behavioral

Neuroscience. 2015;**21**:197-227. DOI: 10.1007/7854_2014_345

[61] Perez PR. The etiology of psychopathy: A neuropsychological perspective. Aggression and Violent Behavior. 2012;**17**:519-522. DOI: 10.1016/j.avb.2012.07.006

[62] Schiffer B, Müller BW, Scherbaum N, Hodgins S, Forsting M, Wiltfang J, et al. Disentangling structural brain alterations associated with violent behavior from those associated with substance use disorders. Archives of general psychiatry—JAMA. Network. 2011;**68**:1039-1049. DOI: 10.1001/archgenpsychiatry.2011.61

[63] Craig MC, Catani M, Deeley Q, Latham R, Daly E, Kanaan R, et al. Altered connections on the road to psychopathy. Molecular Psychiatry. 2009;**14**:946-953. DOI: 10.1038/mp.2009.40

[64] Klune CB, Jin B, DeNardo LA. Linking mPFC circuit maturation to the developmental regulation of emotional memory and cognitive flexibility. eLife. 2021;**10**:1-33. DOI: 10.7554/eLife.64567

[65] Decety J, Chen C, Harenski C, Kiehl KA. An fMRI study of affective perspective taking in individuals with psychopathy: Imagining another in pain does not evoke empathy. Frontiers in Human Neuroscience. 2013;**7**:1-12. DOI: 10.3389/fnhum.2013.00489

[66] Korponay C, Pujara M, Deming P, Philippi C, Decety J, Kosson DS, et al. Impulsive-antisocial psychopathic trains linked to increased volume and functional connectivity. Social, Cognitive, and Affective Neuroscience. 2017;**12**:1169-1178. DOI: 10.1093/scan/nsx042

[67] Motzkin JC, Newman JP, Kiehl KA, Koenigs M. Reduced prefrontal connectivity in psychopathy. The Journal of Neuroscience. 2011;**31**:17348-17357. DOI: 10.1523/JNEUROSCI.4215-11.2011

[68] Del Casale A, Kotzalidis GD, Rapinesi C, Di Pietro S, Alessi MC, Di Cesare G, et al. Functional neuroimaging in psychopathy. Neuropsychobiology. 2015;**72**:97-117. DOI: 10.1159/000441189

[69] Blair RJR, Cipolotti L. Impaired social response reversal: A case of 'acquired sociopathy'. Brain. 2000;**123**:1122-1141. DOI: 10.1093/brain/123.6.1122

[70] Brower MC, Price BH. Neuropsychiatry of frontal lobe dysfunction in violent and criminal behaviour: A critical review. Journal of Neurology, Neurosurgery, and Psychiatry. 2001;**71**:720-726. DOI: 10.1136/jnnp.71.6.720

[71] Cipriani G, Borin G, Vedovello M, Fiorino AD, Nuti A. Sociopathic behavior and dementia. Acta Neurologica Belgia. 2013;**113**:111-115. DOI: 10.1007/s13760-012-0161-7

[72] Damasio AR, Tranel D, Damasio H. Individuals with sociopathic behavior caused by frontal lobe damage fail to respond autonomically to social stimuli. Behavioural Brain Research. 1990;**41**:81-94. DOI: 10.1016/0166-4328(90)90144-4

[73] de Oliveira-Souza R, Paranhos T, Moll J, Grafman J. Gender and hemispheric asymmetries in acquired sociopathy. Frontiers in Psychology. 2019;**10**:1-14. DOI: 10.3389/fpsyg.2019.00346

[74] Gregory S, Ffytche D, Simmons A, Kumari V, Howard M, Hodgins S, et al. The antisocial brain: Psychopathy matters: A structural MRI investigation

of antisocial male violent offenders. Archives of general psychiatry—JAMA. Network. 2012;**69**:962-972. DOI: 10.1001/archgenpsychiatry.2012.222

[75] Mendez MF, Chen AK, Shapira JS, Miller BL. Acquired sociopathy and frontotemporal dementia. Dementia and geriatric cognitive disorders. 2005;**20**:99-104. DOI: 10.1159/000086474

[76] Mendez MF, Shapira JS, Saul RE. The spectrum of sociopathy in dementia. Journal of Neuropsychiatry and Clinical Neuroscience. 2011;**23**:132-140. DOI: 10.1176/jnp.23.2.jnp132

[77] Tang Y, Long J, Wang W, Liao J, Xie H, Zhao G, et al. Aberrant functional brain connectome in people with antisocial personality disorder. Scientific Reports. 2016;**6**:1-12. DOI: 10.1038/srep26209

[78] Gescher DM, Kahl KG, Hillemacher T, Frieling H, Kuhn J, Frodl T. Epigenetics in personality disorders: Today's insights. Frontiers in Psychiatry. 2018;**9**:1-20. DOI: 10.3389/fpsyt.2018.00579

[79] Hicks BM, Carlson MD, Blonigen DM, Patrick CJ, Iacono WG, Gue MM. Psychopathic personality traits and environmental contexts: Differential correlates, gender differences, and genetic mediation. Personality Disorders. 2012;**3**:209-227. DOI: 10.1037/a0025084

[80] Bzdok D, Langner R, Schilbach L, Engemann DA, Laird AR, Fox PT, et al. Segregation of the human medial prefrontal cortex in social cognition. Frontiers in Human Neuroscience. 2013;**7**:1-17. DOI: 10.3389/fnhum.2013.00232

[81] Broomhall L. Acquired sociopathy: A neuropsychological study of executive dysfunction in violent offenders. Psychiatry, Psychology, and Law. 2005;**12**:367-387. DOI: 10.1375/pplt.12.2.367

[82] Schultz DH, Balderston NL, Baskin-Sommers AR, Larson CL, Helmstetter FJ. Psychopaths show enhanced amygdala activation during fear conditioning. Frontiers in Psychology. 2016;**7**:1-12. DOI: 10.3389/fpsyg.2016.00348

[83] Anton ME, Baskin-Sommers AR, Vitale JE, Curtin JJ, Newman JP. Differential effects of psychopathy and antisocial personality disorder symptoms on cognitive and fear processing in female offenders. Cognitive, Affective, & Behavioral Neuroscience. 2012;**12**:761-776. DOI: 10.3758/s13415-012-0114-x

[84] Jacob GA, Arntz A. Schema therapy for personality disorders—A review. International Journal of Cognitive Therapy. 2013;**6**:171-185. DOI: 10.1521/ijct.2013.6.2.171

[85] Oldham JM. Psychodynamic psychotherapy for personality disorders. The American Journal of Psychiatry. 2007;**164**:1465-1467. DOI: 10.1176/appi.ajp.2007.07071174

[86] Clarkin JF, Fonagy P, Gabbard GO, editors. Psychodynamic Psychotherapy for Personality Disorders: A Clinical Handbook. Washington: American Psychiatric Publishing; 2010. p. 486

[87] Town JM, Abbass A, Hardy G. Short-term psychodynamic psychotherapy for personality disorders: A critical review of randomized controlled trials. Journal of Personality Disorders. 2011;**25**:723-740. DOI: 10.1521/pedi.2011.25.6.723

[88] Bateman A, Fonagy P. Mentalization-based therapy. Psychoanalytic Inquiry. 2013;**33**:595-613. DOI: 10.1080.07351690.2013.835170

[89] McGauley G, Yakeley J, Williams A, Bateman A. Attachment, mentalization and antisocial personality disorder: The possible contribution of mentalization-based therapy. European Journal of Psychotherapy & Counselling. 2011;**13**:371-393. DOI: 10.1080/13642537.2011.629118

[90] Pemment J. Psychopathy versus sociopathy: Why the distinction has become crucial. Aggression and Violent Behavior. 2013;**18**:458-461. DOI: 10.1016/j.avb.2013.07.001

Chapter 5

The Mediating Role of Hostile Attribution Bias in the Relationship between Cluster B Personality Traits and Reactive Aggression: An Event-Related Potentials Study

Adriana Ursulet, Émilie de Repentigny, Joyce E. Quansah, Monique Bessette and Jean Gagnon

Abstract

The aim of this study was to better understand the role of hostile attribution bias (HAB) in the relationship between cluster B personality traits and reactive aggression. Sixty-three French-speaking adults were asked to complete online questionnaires assessing their personality traits, hostile attribution bias, and aggressive behaviors. While brain activity was recorded, they were asked to read scenarios involving daily life interactions and to imagine why the characters (whose intentions were ambiguous) behaved in a provocative manner toward them. Following each scenario, we analyzed the N400 component of the event-related brain potential associated with the presentation of unexpected hostile or nonhostile intentions after each scenario. Results showed a stronger N400 amplitude during the presentation of unexpected nonhostile intentions (hostile expectancy violations) in the centro-parietal regions. There was no mediating effect of hostile or nonhostile expectancy violation in the relationship between cluster B personality characteristics and reactive aggression. Further studies are needed to better understand the psychological processes underlying aggressive behaviors in cluster B personality disorders.

Keywords: personality disorders, antisocial personality disorder, borderline personality disorder, aggressive behavior, hostile attribution bias, evoked potentials, electroencephalography, N400, hostile expectancy violation paradigm

1. Introduction

Personality disorders are conditions that can have a destructive impact on an individual's quality of life and social interactions. Indeed, a person with a personality disorder will experience serious difficulties managing emotions, behaving according to culturally acceptable cognitions, and interacting normally in everyday life [1]. In

the United States, 9–15% of people develop a personality disorder and in most cases, this disorder is accompanied by numerous comorbid conditions [2]. The situation is even more worrisome considering that personality disorders are commonly associated with aggression, violence, criminal behavior, and violent recidivism worldwide [3]. According to a systematic review, 65% of incarcerated men and 42% of incarcerated women have a personality disorder [4]. These epidemiological data underline the importance of better understanding and treating personality disorders, particularly those in cluster B. According to the DSM-5, cluster B personality disorders are characterized by relational disorders and impulsive, emotional, and/or unstable behavioral manifestations [1]. They include disorders such as antisocial personality disorder (ASPD) and borderline personality disorder (BPD) and tend to be strongly associated with a variety of maladaptive behaviors, including addictive, suicidal, or aggressive behavior.

BPD is characterized by pervasive instability of affects, self-representations, and interpersonal relationships [1]. It also includes the presence of impulsiveness, paranoia, feelings of emptiness, and/or suicidal gestures. BPD has a lifetime prevalence of approximately 6% among both sexes [5]. In a population of adolescents, BPD traits are associated with high levels of delinquency, antisocial behavior, and all forms of aggression (e.g., sexual harassment, overt aggression, and violence). As such, the diagnosis of borderline personality is, according to some authors, a good predictor of violence and aggression [6]. Moreover, in hospital settings, 65% of patients with BPD report having used physical, verbal, or relational gestures that were aggressive [7]. According to several authors, aggressive behaviors among borderline patients are guided by emotions [8]. In fact, BPD patients are prone to overreact, which leads to irritability, outbursts of anger, and subsequent physical aggression.

The DSM-5 describes ASPD as a pattern of violation of, and disregard for, the rights and interests of others [1]. It is expressed through a lack of social conformity, use of deception for personal gain, lack of remorse, and irresponsible, irritable, or impulsive behavior. In the United States, the prevalence of ASPD is 3.63% in the general population and the prison population, as high as 21–47% [4]. Moreover, in young adults, self-reports of two antisocial characteristics (i.e., sensation-seeking and egocentricity) have been associated with relational aggression [9]. More generally, ASPD diagnosed in clinical populations has been shown to be a strong predictor of violence and aggression [6]. Further, high levels of aggression have been associated with ASPD regardless of gender [3]. Authors suggest that violent behavior by antisocial patients can be explained as being part of an instrumental goal, such as for the purpose of obtaining gratification [8].

Conceptually, aggression refers to intentional and observable action directed toward someone with the goal of physically or mentally harming them [10]. Aggression is said to be reactive when it occurs under provocation, threat, or frustration. It is expressed through outbursts of uncontrolled anger and cognitive scripts involving distinct expectations and hostile perceptions. Aggressive behaviors have disastrous economic, legal, and social consequences [11]. Since the impacts are observable at the individual, family, community, and national levels, many programs have been developed to prevent and reduce aggression. One potential area of intervention could consist of decreasing aggressive cognitions that cause the individual to perceive the world as a dangerous environment and to reconsider the use of aggression when a conflict occurs.

Relatedly, a meta-analysis of studies conducted with people without BPD or ASPD showed a strong relationship between aggression and the hostile attribution bias

(HAB) [12]. According to Crick & Dodge's [13] theory of social information processing, HAB refers to a tendency to attribute hostile intentions to others despite the intention behind their behavior being ambiguous [14]. In more than 100 studies, the positive relationship between reactive aggression and HAB has been demonstrated in clinical and normal samples of individuals of different ages and ethnicities [14–16].

In an ambiguous and provocative situation, people with BPD tend to interpret events (such as abuse or rejection) as threatening [17]. This leads them to be overly sensitive to rejection, behave impulsively, and feel negative emotions. According to several authors, dysregulation of affect and behavior, which is characteristic of BPD, is associated with various cognitive biases, such as the HAB [18]. In fact, a study by Arntz et al. [19] found that people with BPD showed a readiness to perceive a person as negative, aggressive, malicious, abusive, and rejecting. Thus, it is quite possible that the HAB can explain why people with BPD act aggressively toward others. Smeijers et al. [20] have shown that patients with BPD often produce a lot of hostile interpretation biases.

With regard to ASPD, few studies have tested the HAB as an explanatory variable for reactive aggression [20, 21]. According to Lobbestael et al. [21], ASPD traits and HAB (measured using thumbnails and images) were good predictors of reactive aggression. Further Smeijers et al. [20] found that people with ASPD performed many HABs when looking at facial expressions.

The HAB can be measured using self-reports [22], written vignettes [21], video vignettes [23], and computer tasks [20]. For example, in the study by Lobbestael et al. [21], HAB was measured using eight images from the thematic apperception test and eight text vignettes describing ambiguous and provocative scenes from daily life. Participants were asked to describe the scenes and rate the hostile, positive, negative, and neutral character of each scene on a 4-point scale, ranging from most plausible to least plausible. While all of the previously mentioned HAB measures provide interesting results, they are not without flaws. Indeed, these methods do not allow for the measurement of spontaneous inferences and rapid intention attribution processes that are characteristic of the HAB. The latter occurs in the early stages of social information processing [13]. Before providing their responses, participants have time to consider other, more socially acceptable interpretations.

To capture the first cognitive processes of real-time intention attribution, Gagnon et al. [24] developed an innovative measurement method based on the recording of brain signals. The aim was to present different scenarios on a screen that, in written form, describe a character performing ambiguous behavior toward the reader in a context-specific manner (see **Table 1**). The context was either hostile or nonhostile and the reader was asked to read the scenarios while imagining the intention of the character. Subsequently, the character's actual intention was revealed through a final target word and event-related potentials (ERPs) were recorded. The intention could be either hostile or nonhostile. In principle, when the hostile or nonhostile nature of the intention was at odds with the hostile or nonhostile nature of the context, expectations about the intention of the character being portrayed were violated. According to Gagnon et al. [24], the ERP component N400 was observable when hostile expectations were violated. In the literature, N400 is described as a negative deflection occurring around 200–500 ms poststimulus presentation [24, 25]. Its amplitude is maximal in the centro-parietal regions of the brain and is triggered when the word presented is unexpected or inconsistent with the context in the scenario [25]. In a study by Gagnon et al. [26], the N400 directly measured expectation violation, and its amplitude was stronger among aggressive individuals compared to nonaggressive individuals during the hostile expectations violation than during the nonhostile expectations violation.

List	First sentence—context	Second sentence—behavior	Third sentence—intention	Condition
1	You're playing soccer against a team that has an aggressive style	On a breakaway, the defender trips you up	The defender wants to **hurt** you[a]	Hma
2	You have soccer practice with your team			Hmi
1	You're having dinner with friends and Sylvie, who's obnoxious	She does not mention that your shirt is stained	Sylvie does not want to **embarrass** you[b]	NHmi
2	You're having dinner with friends and Sylvie who's nice			NHma

NHma = nonhostile match; NHmi = nonhostile mismatch; Hma = hostile match; Hmi = hostile mismatch. Here, the target word is in bold. Translation in English of [a] "Le défenseur veut vous **blesser***", [b] "Sylvie ne veut pas vous* **embarrasser***".*

Table 1.
Examples of scenarios under the four conditions of the hostile expectancy violation paradigm.

The main goal of this study is to examine the mediating role of the HAB (measured by EEG and self-report) in the relationship between cluster B personality traits and reactive aggression. To achieve this, we present several objectives and hypotheses. (1) First, we want to replicate and validate the HAB measurement method developed by Gagnon et al. [24]. Our first hypothesis is that N400 will be more pronounced in the right posterior brain regions during the hostile expectations violation. (2) Secondly, we aim to evaluate the predictive role of ASPD traits, BPD traits, and HAB (as measured by EEG and self-report) on self-reported reactive aggressive behaviors. (a) We hypothesize that ASPD and BPD traits will positively and significantly predict self-reported reactive aggression. (b) We hypothesize that ASPD and BPD traits will significantly predict self-reported HAB and hostile expectations violation. (c) We expect a neurophysiological and self-reported measure of HAB to significantly predict reactive aggression. (d) Finally, we expect that self-reported and neurophysiological HAB will mediate the relationship between cluster B personality traits and reactive aggression.

2. Methods

2.1 Participants

Seventy-two French-speaking adults were recruited from university classes in two metropolitan universities, a list of former patients who consulted in a personality disorders clinic, and the general population through posters and announcements on Facebook and Kijiji. Interested individuals were then contacted by email to receive information about the study and to make an appointment for a laboratory visit. All participants were between 18 and 65 years of age, had normal vision with or without correction and had no history of psychosis, neurological disorder, or severe brain damage. Seventeen of them had been taking a central nervous system medication (e.g., anxiolytic, stimulant, SSRI, SNRI, and antidepressant) for at least 2 weeks prior to the day of the experiment. Before the visit, participants were asked not to use other drugs or alcohol for at least 1 week and 24 h prior to the experiment, respectively. Failure to comply with any of these instructions resulted in the postponement of

the appointment. All participants received financial compensation of $25 at the end of the appointment. Nine participants were excluded due to attrition, a significant amount of missing data, a mother tongue other than French, or excessive artifacts on the EEG signals caused by eye movements. The final sample consisted of 63 participants (46 females and 17 males) with an average age of 29 (SD = 1.44) and 15 years of education (SD = .40).

2.2 Measure

Personality Assessment Questionnaire [27, 28]. Only scales of the French adaptation assessing borderline and antisocial personality traits were included. Each subscale consisted of 24 items. The *Antisocial Characteristics Scale* (ASPD features) consisted of eight items measuring antisocial behavior, eight items measuring egocentricity, and eight items measuring stimulus seeking. The *Borderline Characteristics Scale* (BPD features) consisted of six items assessing affective instability, six items assessing identity problems, six items assessing negative relationships, and six items assessing self-harm. Each item was scored on 4 Likert-type points, ranging from 0 = False, not at all true to 3 = Very true. For each subscale, the scores on the 24 items were added together to form a total score for antisocial traits and a total score for borderline traits. Higher scores reflected the greater degree of personality traits. According to Morey [28], several studies have demonstrated the reliability and validity of the PAI subscales in normal, clinical, and student populations [29]. In our study, the internal consistency was excellent for the ASPD features scale (α = .91) and the BPD features scale (α = .90).

Brief Symptom Inventory (BSI; [30]). Two scales from the French version of the BSI [31] were used to measure the level of depression and paranoia and used as control variables as both traits are associated with HAB [32, 33]. The depression scale consisted of six items, while the paranoid ideation scale consisted of five items. Each item was answered using a 5-point Likert-type scale, ranging from 0 = not at all to 4 = extremely. For each scale, a total score was calculated by adding up all item scores. The higher the score, the greater the level of traits. The reliability and validity of the BSI dimensions have been demonstrated in normal and clinical population samples [34, 35]. In our study, Cronbach's alpha was good for the depression scale (α = .84) and paranoid ideation (α = .81).

Reactive-Proactive Aggression Questionnaire (RPQ; [36]). The French version of the RPQ [16] was used to assess aggression behaviors. The questionnaire included an 11-item scale measuring reactive aggression (e.g., getting angry at the provocation of others) on a 3-point Likert-type scale, ranging from 0 = never to 2 = often. The reactive aggression scores were calculated by adding the item scores. Higher scores indicated greater aggressive behaviors. Reliability and validity were tested in multiple samples of incarcerated and nonclinical individuals ages 6–64 years old [36, 37]. In our sample, the internal consistency was good for the reactive aggression scale (α = .82).

Social Information Processing – Attribution and Emotional Response Questionnaire (SIP-AEQ; [22]). The French version of the SIP-AEQ [38] was administered to measure the HAB. The SIP-AEQ included eight vignettes depicting scenes of everyday life where a character acts provocatively and has ambiguous intentions. For each vignette, participants were asked to rate the likelihood that the character's intention was directly hostile, indirectly hostile, neutral, or instrumental (four items per vignette). Each item was rated on a 4-point Likert-type scale, ranging from 0 = not at all likely to 3 = very likely. Hostile attribution biases were calculated by averaging the responses

to the eight vignettes for each hostile intention type (HAB-direct; HAB-indirect). The HAB score was determined by adding HAB-direct and HAB-indirect. The higher the score, the higher the HAB. According to Coccaro et al. [23], the reliability and validity of the SIP-AEQ have been demonstrated in multiple samples. In our sample, Cronbach's alpha was excellent for HAB ($\alpha = .93$).

The last questionnaire administered assessed age, gender, mother tongue, and education status.

2.3 Stimuli

The stimuli constituted 320 scenarios depicting social interactions encountered in everyday life and was developed by Gagnon et al. [24] to test hostile and nonhostile expectancy violations. Each scenario consisted of three sentences (see **Table 1**). The first sentence described a typically hostile or nonhostile context. The second sentence depicted a character whose intention was ambiguous, thus committing potentially provocative behavior to the reader. The last sentence included a final target word that resolved the ambiguity by clarifying the intention behind the behavior. The scenarios were created under four conditions—hostile match (Hma), hostile mismatch (Hmi), nonhostile match (NHma), and nonhostile mismatch (NHmi). When the conditions were hostile, the target word indicated hostile intent on the part of the character's behavior. Conversely, when the conditions were nonhostile, the intention was depicted as nonhostile. Conditions were said to be a match when the hostile or nonhostile nature of the intention was consistent with the hostile or nonhostile nature of the context. Similarly, conditions were said to be mismatched when the hostile or nonhostile nature of the intention differed from the hostile and nonhostile nature of the context. Two lists of 160 scenarios (i.e., 2 × 40 scenarios for each of the four conditions) were used to balance the match and the mismatch conditions with the hostile and the nonhostile conditions across participants. For a given scenario, the match and mismatch versions shared the same behaviors and intentions but differed in the hostile or nonhostile nature of the context. The first two sentences were composed of a maximum of 25 words and the last sentence a maximum of eight words. The third sentence was phrased negatively in almost 50% of the scenarios for each condition. The two lists were administered alternately and equally across participants. A list of 20 additional scenarios (i.e., 5 × 4 scenarios for each of the four conditions) was developed for the purpose of practice and comprehension trials.

2.4 Procedure

After completing the online questionnaire and giving their written consent, participants were invited to the laboratory to perform the experimental task. While their brain activity was recorded, they were asked to read the daily life interaction scenarios and visualize them as though they were actually experiencing them. As they read the first two sentences, the reader had to imagine why the characters were behaving in such a way toward them (intention attribution process). Once ready, they could initiate the presentation of the third sentence. For each scenario, a trial consisted of presenting the first two sentences for at least 1500 ms. After pressing the space bar on the keyboard, a delay of 500 ms without stimuli was followed by a fixation cross appearing in the center of the screen for 1000 ms. A third sentence was then displayed, word by word, in the center of the screen and ended with the target word. Each word was presented for 300 ms, with a delay of 200 ms between

words. Finally, a fixation cross was displayed in the center of the screen for 2000 ms. The participant had to keep his eyes focused on the center of the screen and refrain from blinking from the appearance of the first cross until the disappearance of the second cross. In total, there were four practice trials followed by 10 blocks of 17 trials (170 trials). Each block consisted of 16 experimental trials (four scenarios for each of the four conditions: Hma, Hmi, NHma, and NHmi) and one trial used as a comprehension test. The comprehension trial was followed by a true or false question. The purpose of this question was to ensure that the participant was reading and understanding the scenarios. The participant could answer by pressing the letter N (true) or M (false). A correct/incorrect answer was followed by feedback (green or red cross, respectively). For our sample, the average rate of correct answers was 91.1%, indicating a high rate of comprehension. The experimental trials were presented in random order and without repetition. The blocks were separated by a break, the duration of which was determined by the participant. The words and fixation crosses were written in white, Helvetica font, size 14, bold, on a 17-inch (43.18 cm) black screen. The distance between the screen and the participant's eye was 70 cm. Three characters corresponded to approximately 1° of visual angle. The experimental task was created using E-Prime 2.0 software (*E-Prime*, Psychology Software Tools, Pittsburgh, PA) [39].

2.5 Electrophysiological methods

The electroencephalography took place in a Faraday cage and under medium brightness. The brain activity of the participants was captured using 64 Ag/AgCI electrodes in an elastic cap. The position of the electrodes was done according to the International 10–10 System [40]. The right and left mastoids were used as references. One electrode was placed below the left eye to capture blinking and vertical eye movements. Two other electrodes were placed at the outer canthi of the eyes to capture horizontal eye movements. The signals were processed and recorded via a Biosemi ActiveTwo amplifier system (Amsterdam, Netherlands) at a sampling frequency of 512 Hz. Online, a 0.16 Hz high-pass filter and a 100 Hz low-pass filter were applied to the EEG signals. On Matlab, a 0.1 Hz high-pass filter and a 30 Hz low-pass filter were applied during offline analyses. The resulting signals were segmented in trials according to a time window of from 200 ms before, to 800 ms after the target word onset. The baseline time window ranged from −200 ms to 0 ms. Trials containing too many artifacts (i.e., eye or muscle movements) were rejected using an independent component analysis [41]. Rejection thresholds were applied for blink (i.e., > 80 mV within a time window of 150 ms) and for eye movement (i.e., > 35 mV within a time window of 300 ms). Electrodes with a noisy EEG signal (i.e., exceeding +/− 100 mV voltage) were interpolated by spherical spline. When more than seven electrodes were noisy in a trial, the trial was rejected. When the number of rejected trials was greater than 20 per condition, the participant was excluded from the sample. In our final sample, the percentage of rejected trials was less than 17.5% in the four conditions (i.e., 0–17.5% for Hma, 0–15% for Hmi, 0–12.5% for NHma, and 0–12.5% for NHmi). The trials were then averaged by condition (Hma, Hmi, NHma, and NHmi) and for each participant. On average, there were 39 trials per condition. The ERP amplitudes captured by the electrodes were averaged over six lateral regions and three midline regions on the scalp. The lateral electrodes were separated as follows: anterior left (AF3, AF7, F1, F3, F5, F7, FT7, FC1, FC3, FC5), central left (TP7, T7, C1, C3, C5, CP1, CP3, CP5), posterior left (P1, P3, P5, P7, PO3, PO7, O1), anterior right (AF4, AF8, F2, F4, F6, F8, FT8, FC2, FC4, FC6), central right

(TP8, T8, C2, C4, C6, CP2, CP4, CP6), and posterior right (P2, P4, P6, P8, PO4, PO8, O2). The midline electrodes were analyzed as follows—anterior median (AFZ, FZ, FCZ), central median (CZ, CPZ), and posterior median (PZ, POZ, OZ).

2.6 Statistical analyses

Statistical analyses were performed to evaluate the voltage of the ERP amplitudes (dependent variable) according to the conditions (Hma, Hmi, NHma, and NHmi) and location of sensors on the scalp. Each subject being its own control, two repeated measures ANOVAs with Huynh-Feldt corrections were performed. The first ANOVA was for the lateral electrodes. The independent variables were intention (hostile, nonhostile), Consistency (match, mismatch), Hemisphere (left, right), and Location (anterior, central, posterior). Mean ERP amplitudes observed at midline regions were analyzed in a second ANOVA. The independent variables were Intention, Consistency, and Location. Given that our first objective was to demonstrate the presence of an N400 during expectancy violations (mismatch-match conditions), interaction effects involving the Consistency factor were looked at in the ANOVAs. To assess the role of the N400 in our mediation models, we selected regions showing greater negative amplitude (as shown in [24, 25]). Pearson's correlations were performed between all variables. Therefore, several multiple linear regressions were conducted to assess whether antisocial characteristics, borderline characteristics, and the HAB (as measured by self-report or EEG) predicted scores on reactive and proactive aggression. A product-of-coefficient test for mediation analyses was performed by using bootstrapping procedures, a nonparametric resampling technique to test for indirect effects [42]. This method has been recommended as bootstrapping was found not to inflate Type I and Type II error rates and to have higher power [43]. In addition, bootstrapping does not assume multivariate normality. The significance of the mediation effect is determined when the 95% bias-corrected confidence intervals (CIs) do not contain zero. In the current study, estimates are based on 5000 bias-corrected bootstrap samples. All analyses were two-tailed, with an α level set at .05.

3. Results

3.1 N400

Figure 1 shows differences in mean ERP amplitudes between mismatch and match conditions for the nine scalp regions. Mean amplitude differences indicate a negative deflection (N400) at around 350–650 ms during hostile expectancy violations (NHmi-NHma conditions). Based on visual inspection, the greatest deflections were at midline and right sites in the central and posterior regions. When nonhostile expectancies were violated (Hmi-Hma conditions), mean perceived amplitudes neared zero in the central and posterior regions. **Figure 2** shows the topography of mean amplitude differences observed on the scalp from 350 to 650 ms (post target onset) during hostile and nonhostile expectancy violations. During the hostile expectancy violations, the N400 seems to appear in the central and posterior regions of the right hemisphere and the midline sites.

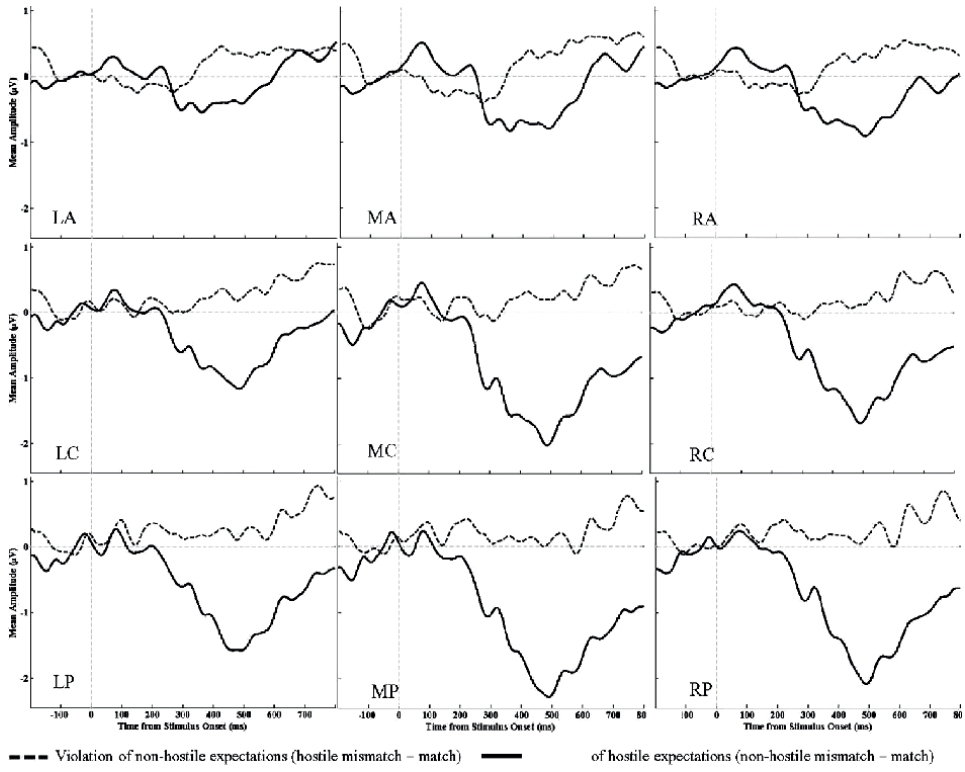


Figure 1.
Difference between the mismatch and match conditions of the grand ERP averages obtained after presentation of the hostile or nonhostile target word for 9 brain regions. LA = anterior left; LC = central left; LP = posterior left; MA = anterior median; MC = central median; MP = posterior median; RA = anterior right; RC = central right; RP = posterior right.

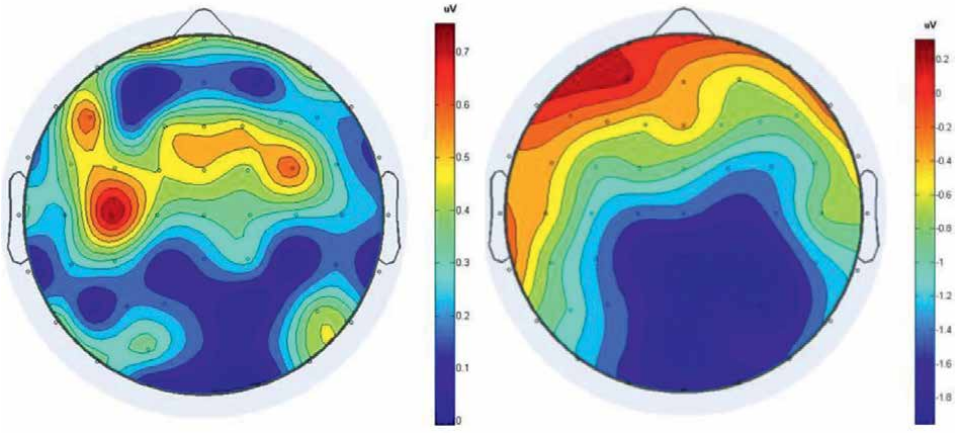


Figure 2.
The topographic map of ERP mean differences between mismatch and match conditions from 350 to 650 ms after presentation of hostile or nonhostile target words. On the left, nonhostile expectancy violation (hostile mismatch-match). On the right, hostile expectancy violation (nonhostile mismatch-match).

For the lateral electrodes ANOVA, there was an interaction effect between Intention, Consistency, and Location ($F(2.124) = 5.90$; $p = .01$), and between Intention, Consistency, and Hemisphere ($F(1,62) = 5.21$; $p = .03$). For these interactions, effect sizes were moderate (partial $R^2 = .08$; partial $R^2 = .09$, respectively). Simple effects for these last two interactions were assessed for Consistency factor by paired comparisons with post hoc Bonferroni adjustment. The levels of the Consistency factor (match and mismatch) differed significantly for the nonhostile intention in the central and posterior regions, with an adjusted alpha of .004. There was no difference between hostile mismatch and hostile match at anterior, central, and posterior sites.

For the midline regions ANOVA, there was an interaction effect between factors of Intention and Consistency ($F(1,62) = 16.16$; $p = .00$), between factors of Consistency and Location ($F(2,124) = 10.59$; $p = .00$), and between factors of Intention, Consistency, and Location ($F(2,124) = 5.60$; $p = .01$). Effect sizes for these interactions were high to moderate (partial $R^2 = .21$; partial $R^2 = .15$; partial $R^2 = .08$). Simple effects for the last interaction were evaluated for the Consistency factor by paired comparisons with post hoc Bonferroni adjustment. The level of Consistency factor differed significantly for nonhostile intention at central and posterior regions on the scalp with an adjusted alpha of .004. There was no difference between mismatch and match for hostile Intention in anterior, central, and posterior regions.

These results confirm the presence of the N400 in central and posterior regions in the nonhostile intention condition (i.e., when hostile expectations were violated). In the hostile Intention condition (i.e., during nonhostile expectancy violations), the N400 was not significantly visible. Since the ERP waveform differences and the topographic map indicated a stronger N400 effect in the central and posterior regions of the right and midline sites, we selected MC, RC, MP, and RP regions for further analysis.

3.2 Prediction of reactive aggression

The scores of all self-report scores were normally distributed, except for antisocial behavior that had positive skewed distributions as observed in the general population.

Correlation coefficients of the variables of interest are presented in **Table 2**. Reactive aggression was significantly correlated with age, depression, antisocial traits, borderline traits, and nonhostile expectancy violations (hostile Intention condition) in the MC ($r = -.29$, $p £ .05$ two-tailed), MP ($r = -.25$, $p £ .05$ two-tailed), RC ($r = -.35$, $p £ .01$ two-tailed), and RP ($r = -.32$, $p £ .01$ two-tailed) region. In addition, antisocial traits were significantly correlated with gender, paranoid ideation and borderline traits, and indirect hostile attribution bias ($r = .30$, $p £ .05$ two-tailed). Borderline traits were significantly correlated with paranoid ideation, depression, and self-reported HAB. Reactive aggression was not significantly correlated with hostile expectancy violations (nonhostile intention condition). Because the correlation between hostile or nonhostile expectancy violations and aggression scores was more strongly consistent in the RC region than in the MC, MP, and RP regions, regression analyses were performed in the RC region.

A first regression was conducted with ASPD features as the independent variable (**Figure 3**). Hostile expectancy violation (nonhostile intention condition) and self-reported HAB were the mediator variables and age, sex, education, BPD features, paranoid ideation, and depression traits served as covariates. Results showed a nonsignificant indirect effect for the hostile expectancy violation (indirect = −.00,

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	—											
2. Gender	**.27***	—										
3. Education	−.11	−.12	—									
4. Paranoid idea	.13	.01	.09	—								
5. Depression	.07	.06	.08	**.49****	—							
6. ASPD features	.08	**.39****	.04	**.26***	.19	—						
7. BPD features	.05	.03	.21	**.58****	**.68****	**.48****	—					
8. REAG	**.26***	.23	.06	.24	**.41****	**.47****	**.52****	—				
9. HAB	.13	.11	−.11	**.58****	**.37****	.25	**.34****	.14	.16	—		
10. HN400RC	−.01	−.08	.03	.00	.10	−.10	−.11	**−.35****	**−.27***	.18	—	
11. NHN400RC	.14	**.26***	−.09	−.13	−.01	−.00	−.21	.19	.01	−.08	−.03	—

*$p \leq .05$.
**$p \leq .01$.
REAG: reactive aggression; HAB: hostile attribution bias – SIP-AEQ; HN400RC: N400 effect in RC region for nonhostile expectancy violations; NHN400RC: N400 effect in RC region for hostile expectancy violations.

Table 2.
Correlation matrix.

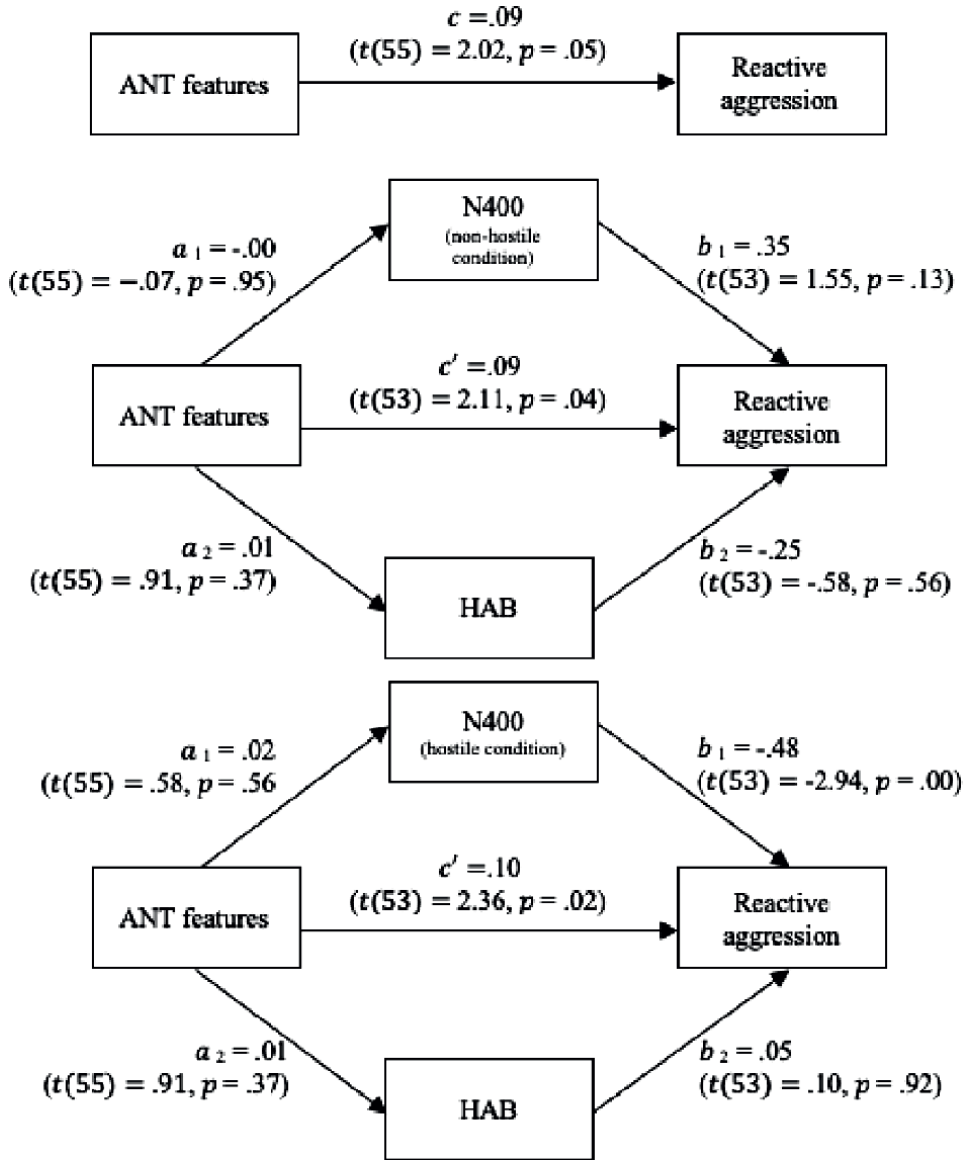


Figure 3.
Mediation of antisocial characteristics—reactive aggression relationship by the hostile attribution bias and the N400 in hostile and the nonhostile conditions.

SE = .01, 95% CI [−.02; .02]) and self-reported HAB (indirect = −.00, *SE* = .01, 95% CI [−.02; .01]). The model explained 44% of the variance of reactive aggression, $F(9, 53) = 4.56$, $p < .001$ with antisocial characteristics and hostile expectancy violation as significant predictors. The same regression was assessed with nonhostile expectancy violation (hostile Intention condition) and self-reported HAB as mediator variables (**Figure 3**). Results showed a nonsignificant indirect effect for nonhostile expectancy violation (indirect = −.01, *SE* = .02, 95% CI [−.05; .04]) and self-reported HAB (indirect = .00, *SE* = .01, 95% CI [−.02; .02]). The model explained 50% of the variance of reactive aggression, $F(9, 53) = 5.73$, $p < .0001$ with antisocial characteristics

and nonhostile expectancy violation as significant predictors. These results indicated that neither electrophysiological (hostile and nonhostile expectancy violations) nor self-report measures of HAB mediated the relationship between ASPD traits and reactive aggression.

A third regression was conducted with BPD features as the independent variable, hostile expectancy violation (nonhostile intention condition), and self-reported HAB as mediator variables and age, sex, education, ASPD features, paranoid ideation and depression traits served as covariates (**Figure 4**). Results showed a nonsignificant indirect effect for the hostile expectancy violation (indirect = −.02, *SE* = .02, 95% CI

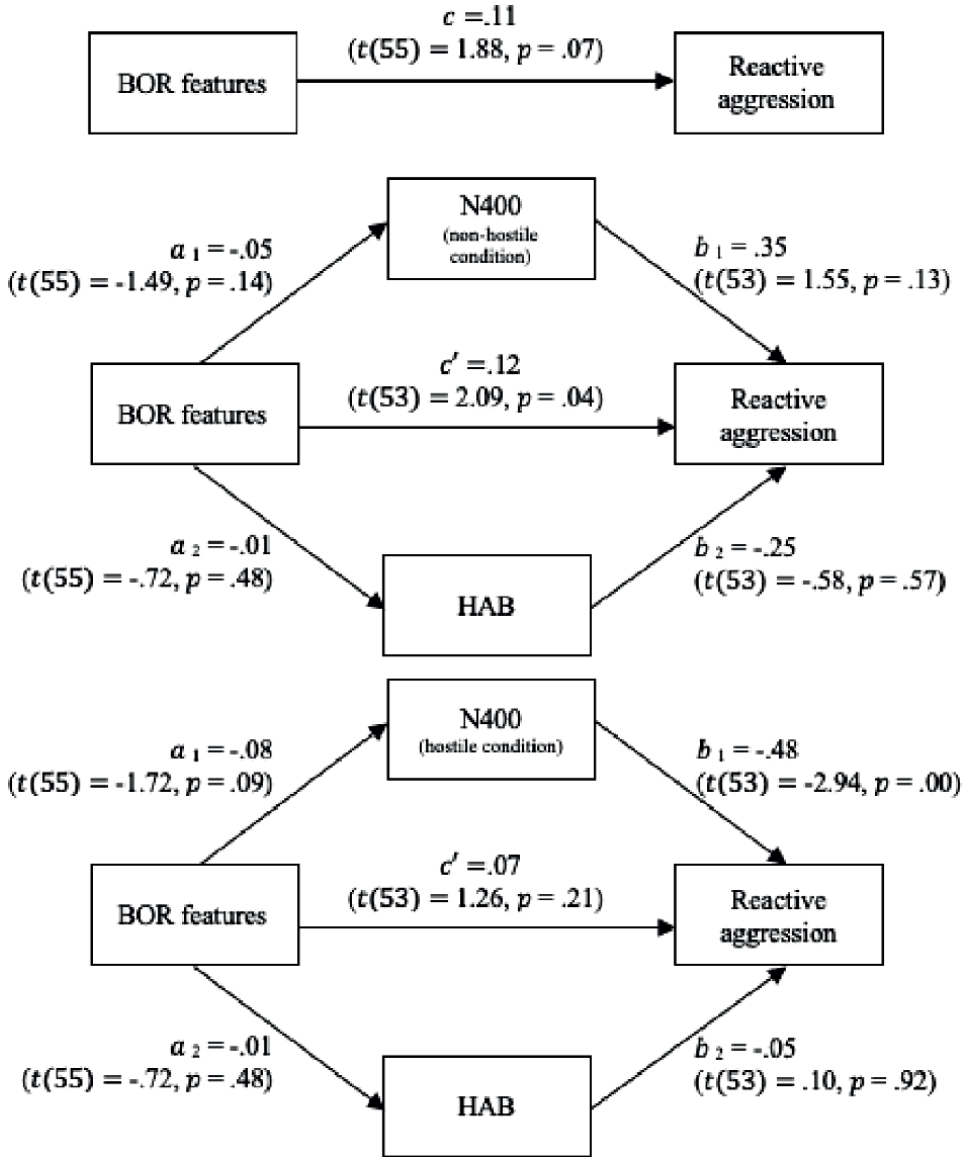


Figure 4.
Mediation of borderline characteristics—reactive aggression relationship by the hostile attribution bias and the N400 in hostile and nonhostile condition.

[−.06; .01]) and self-reported HAB (indirect = .00, *SE* = .01, 95% CI [−.01; .03]). The model explained 44% of the variance of reactive aggression, $F(9, 53) = 4.56$, $p < .0001$ with borderline characteristics and hostile expectancy violation as significant predictors. Also, borderline characteristics predicted hostile expectancy violation. A final regression was assessed with nonhostile expectancy violation (hostile Intention condition) and self-reported HAB as mediator variables and the same covariates (**Figure 4**). Results showed a nonsignificant indirect effect for the nonhostile expectancy violation (indirect = .04, *SE* = .03, 95% CI [−.00; .10]) self-reported HAB (indirect = −.00, *SE* = .01, 95% CI [−.02; .02]). The model explained 50% of the variance of reactive aggression, $F(9, 53) = 5.73$, $p < .0001$ with only nonhostile expectancy violation as a significant predictor. Therefore, neither hostile and nonhostile expectancy violations nor self-report measures of HAB had a mediating effect on the relationship between borderline characteristics and reactive aggression. There was no other significant relationship.

4. Discussion

The first objective of this study was to replicate the measurement method of Gagnon et al. [24] and to validate their results. The aim was to present scenarios describing social interactions while measuring brain activity. In each scenario, characters acted in a provocative and ambiguous manner in both hostile and nonhostile contexts. Participants were asked to read the scenarios on a screen and imagine the intentions behind the behaviors presented. Subsequently, the characters' hostile or nonhostile intentions were revealed through a final target word. As in the study by Gagnon et al. [24], we were able to observe the N400 ERP component in a time window ranging from 350 to 650 ms post-stimulus onset. Moreover, the amplitude of this deflection was more pronounced during the hostile expectancy violation in the central and posterior cerebral regions at the medial and right electrodes. This implied that participants attributed hostile intent to the characters when the context was hostile. This result has been corroborated by several other studies reporting a maximum amplitude N400 in the centro-parietal regions when expectations are violated [24, 25].

During the nonhostile expectancy violation, ERP amplitudes neared zero at approximately 350–650 ms. Therefore, when a nonhostile context was followed by ambiguous and provocative behavior, participants did not attribute a nonhostile intent to the behavior. Although consistent with findings reported in Gagnon et al. [24], this result appears inconsistent with the established assumption that the N400 would reflect an expectancy violation. Gagnon et al. [24] suggest this phenomenon possibly reflects a cautious interpretation, based on perceived cues, on the part of nonaggressive students. It is indeed possible that, in our study, nonhostile contextual cues conflicted with the ambiguous and provocative nature of the behavior. Therefore, the type of intent attribution depended on the weight the participant gave nonhostile cues versus provocative cues. In the end, in scenarios designed to violate nonhostile expectations, the participant may have had mixed views and not been systematically surprised to see hostile intent appear after a nonhostile context.

The second objective of this study was to demonstrate the predictive role of ASPD traits, BPD traits on self-reported aggressive behaviors. As expected, ASPD traits positively predicted reactive aggression in both models, which is consistent with the scientific literature [9, 21]. BPD traits were highly correlated with reactive aggression. However, when controlling for age, gender, education, depression, paranoid ideation,

and ASPD traits, they did significantly predict reactive aggression in one model only. This result was surprising given that several studies have shown BPD to be a good predictor of reactive aggression [6, 7, 9]. In a recent longitudinal study, however, Penson et al. [29] showed that BPD characteristics were not sufficient in significantly predicting aggressive behaviors and rather, that ASPD characteristics were better predictors. Thus, it is likely that, in our regressions, ASPD traits were more effective predictors of reactive aggression than BPD traits. In addition, BPD traits and ASPD traits shared a high percentage of common variance (r^2 = .24), possibly explaining the nonsignificant coefficient for BPD traits in the regression.

ASPD traits failed to predict both HAB, as measured by self-report, and hostile or nonhostile expectancy violations. These findings are not consistent with the few studies evaluating HAB in ASPD [20, 21]. However, it is important to mention that the methodology used to measure the HAB could explain the conflicting data. We used the SIP-AEQ questionnaire to measure self-reported HAB and an electrophysiology method developed by Gagnon et al. [24] to measure hostile and nonhostile expectancies violations. As such, it is possible to expect different results across studies. Given that ASPD is characterized by a lack of conformity to societal norms [1], it is also possible that the individuals with ASPD in our study did not relate to the characters or that they experienced difficulty imagining the situations described in our task.

BPD traits also did not predict self-reported HAB and nonhostile expectancy violation. In contrast, they positively predicted the hostile expectancy violation (i.e., BPD traits negatively predicted N400). Thus, the higher the BPD traits, the stronger the hostile expectancy violation. In other words, when the context was hostile, people with high BPD traits made more hostile intent attributions than people with lower BPD traits. This result partially confirmed our expectations and was consistent with findings in Smeijers et al. [18]. In addition, several researchers have provided arguments regarding the meaning of such a prediction [17–19]. For example, Lobbestael and McNally [17] demonstrated that people with BPD were subject to interpretive biases related to rejection and anger. According to Baer et al. [18], people with BPD have negative beliefs about themselves and their environment. They also interpret and evaluate neutral and ambiguous stimuli negatively. Finally, according to Arntz et al. [19], people with BPD judge other people as negative, aggressive, and malicious.

Self-reported HAB did not predict reactive aggression in all models, which is in contrast with the numerous studies showing that self-reported HAB is positively related to reactive aggression [15, 16, 44]. It is possible that variability in HAB scores was too small in our study to observe correlations. Regarding the hostile and nonhostile expectancies violations as measured by the N400 effect, results showed an opposite relationship with reactive aggression than expected. First, given that HAB and reactive aggression are positively associated as reported in the literature [15, 16, 44], we assumed that N400 effect in the nonhostile intention condition (hostile expectancies violation) would negatively predict reactive aggression (more negative amplitude associated with higher aggression score). However, because of the chronic accessibility to hostile patterns, it is possible that an aggressive person would see aggression in all their social interactions [45]. Since mismatch and match conditions would have a similar effect in this case, their subtraction should have the effect of reducing the N400 (more positive amplitude going up) as aggressive traits increase. Second, we assumed that nonhostile expectancy violation would negatively predict reactive aggression as nonaggressive individuals would be more surprised to see a hostile intention appear after a hostile context. However, given that the N400 effect was nonsignificant when the intention words were hostile, it is difficult to infer the nature

of the cognitive processes underlying this relationship. Also, it appears that two other studies have found a negative relationship between HAB and reactive aggression [46, 47] suggesting that the relationship between HAB and reactive aggression could be more complex than we may think and difficult to predict.

Finally, our final hypothesis that self-reported HAB, the hostile expectancy violation, and the nonhostile expectancy violation were mediators of the relationship between cluster B personality traits and reactive aggression, could not be confirmed. These findings were inconsistent with the few studies that have evaluated the mediating role of HAB in the relationship between these personality features and reactive aggression [20, 21]. When it comes to cluster B personality, it is possible that the N400 effect (expectancy violation) may be influenced by other mediators, like sensitivity to rejection, impulsivity, and dysfunctional beliefs [17, 18], which were not included in our study. Further studies are therefore needed to better understand the cognitive and affective processes underlying aggressive behavior in antisocial and borderline personality disorders.

This research project had several methodological limitations, such as sample size and heterogeneity. Future analyses using a larger sample would be warranted to better understand the nature of the observed relationships. In addition, our sample potentially over-represented students in the general population. Out of 63 participants, 49 were from an academic background. It would be interesting and beneficial to evaluate our measures on samples more representative of the clinical population.

5. Conclusion

In conclusion, our study replicated the measurement of expectation violations by electrophysiology and validated the presence of a strong negative deflection of ERP amplitudes at the time of hostile expectation violations, as demonstrated in the study by Gagnon et al. [24]. Additionally, our results show that antisocial traits and borderline traits were positively associated with self-reported reactive aggressive behaviors. Our mediation models involving intention attribution processes as mediators could not be confirmed and the unexpected results suggested that HAB and reactive aggression sustain a complex relationship. To better understand the meaning of the relationship between hostile and nonhostile expectancy violation and reactive aggression, more studies are in need to verify how N400 effect among aggressive and nonaggressive participants varies according to various parameters of the ERP task. Nonetheless, this study indicates that electrophysiological measurements can be more sensitive than self-report questionnaires when investigating the nature of cognitive processes associated with reactive aggression. Considering the contribution of socio-cognitive treatments that are offered to aggressive individuals (e.g., [48]), we believe that this study can help to open the way to other empirical studies using ERP tasks to understand the cognitions associated with reactive aggression among cluster B personality disorders.

Acknowledgements

This study was supervised by Dr. Jean Gagnon, PhD, from the Department of Psychology at the University of Montreal. The study was funded by a portion of the supervisor's research funds. The project was supported by Dr. Monique Bessette, PhD,

psychologist and director of the Victoria Institute for participant recruitment. The author would like to thank Dr. Pierre Jolicoeur, PhD, of the Department of Psychology for his support in the analysis of EEG signals. This study was supported by a research grant to JG and PJ from the Social Sciences and Humanities Research Council (SSHRC) (no 435-2018-0963).

Conflict of interest

There is no conflict of interest. This project was approved by the Research Ethics Board of Education and Psychology of the University of Montreal. All procedures were consistent with the Énoncé de politique des trois conseils (EPTC-2, 2018).

Author details

Adriana Ursulet[1,2,3], Émilie de Repentigny[1,2,3], Joyce E. Quansah[1,2,3], Monique Bessette[4] and Jean Gagnon[1,2,3]*

1 Department of Psychology, University of Montreal, Canada

2 Centre for Interdisciplinary Research in Rehabilitation of Greater Montreal, Canada

3 Laboratoire d'électrophysiologie en neuroscience sociale (LENS), University of Montreal, Canada

4 Institut Victoria, Montreal, Canada

*Address all correspondence to: jean.gagnon@umontreal.ca

References

[1] American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders. 5th ed. Virginia, United States: American Psychiatric Publishing; 2013

[2] Lenzenweger MF, Lane MC, Loranger AW, Kessler RC. DSM-IV personality disorders in the National Comorbidity Survey Replication. Biological Psychiatry. 2007;**62**(6): 553-564. DOI: 10.1016/j.biopsych.2006.09.019

[3] Dunsieth NW, Nelson EB, Brusman-Lovins LA, Holcomb JL, Beckman D, Welge JA, et al. Psychiatric and legal features of 113 men convicted of sexual offenses. The Journal of Clinical Psychiatry. 2004;**65**(3):293-300

[4] Fazel S, Danesh J. Serious mental disorder in 23000 prisoners: A systematic review of 62 surveys. Lancet (London, England). 2002;**359**(9306):545-550. DOI: 10.1016/S0140-6736(02)07740-1

[5] Grant BF, Chou SP, Goldstein RB, Huang B, Stinson FS, Saha TD, et al. Prevalence, correlates, disability, and comorbidity of DSM-IV borderline personality disorder: Results from the wave 2 national epidemiologic survey on alcohol and related conditions. The Journal of Clinical Psychiatry. 2008;**69**(4):533-545

[6] Soliman AE-D, Reza H. Risk factors and correlates of violence among acutely ill adult psychiatric inpatients. Psychiatric Services. 2001;**52**(1):75-80. DOI: 10.1176/appi.ps.52.1.75

[7] Zanarini MC, Temes CM, Ivey AM, Cohn DM, Conkey LC, Frankenburg FR, et al. The 10-year course of adult aggression toward others in patients with borderline personality disorder and axis II comparison subjects. Psychiatry Research. 2017;**252**:134-138. DOI: 10.1016/j.psychres.2017.02.054

[8] Haller J, Kruk MR. Normal and abnormal aggression : Human disorders and novel laboratory models. Neuroscience & Biobehavioral Reviews. 2006;**30**(3):292-303. DOI: 10.1016/j.neubiorev.2005.01.005

[9] Ostrov JM, Houston RJ. The utility of forms and functions of aggression in emerging adulthood : Association with personality disorder symptomatology. Journal of Youth and Adolescence. 2008;**37**(9):1147-1158. DOI: 10.1007/s10964-008-9289-4

[10] Bushman BJ, Huesmann LR. Aggression. Dans Handbook of Social Psychology. New Jersey, United States: American Cancer Society; 2010. DOI: 10.1002/9780470561119.socpsy002023

[11] World Health Organization. 10 Facts About Violence Prevention. WHO; World Health Organization; 2017. Available from: http://www.who.int/features/factfiles/violence/en/

[12] Yeager DS, Miu AS, Powers J, Dweck CS. Implicit theories of personality and attributions of hostile intent : A meta-analysis, an experiment, and a longitudinal intervention. Child Development. 2013;**84**(5):1651-1667. DOI: 10.1111/cdev.12062

[13] Crick NR, Dodge KA. Social information-processing mechanisms in reactive and proactive aggression. Child Development. 1996;**67**(3):993-1002. DOI: 10.2307/1131875

[14] De Castro BO, Veerman JW, Koops W, Bosch JD, Monshouwer HJ.

Hostile attribution of intent and aggressive behavior : A meta-analysis. Child Development. 2002;**73**(3):916-934. DOI: 10.1111/1467-8624.00447

[15] Dodge KA, Malone PS, Lansford JE, Sorbring E, Skinner AT, Tapanya S, et al. Hostile attributional bias and aggressive behaviour in global context. Proceedings of the National Academy of Sciences of the United States of America. 2015;**112**(30):9310-9315. DOI: 10.1073/pnas.1418572112

[16] Gagnon J, Rochat L. Relationships between hostile attribution bias, negative urgency, and reactive aggression. Journal of Individual Differences. 2017;**38**(4):211-219. DOI: 10.1027/1614-0001/a000238

[17] Lobbestael J, McNally RJ. An Empirical Test of Rejection- and Anger-Related Interpretation Bias in Borderline Personality Disorder. Journal of Personality Disorders. 2016;**30**(3): 307-319. DOI: 10.1521/pedi_2015_29_194

[18] Baer RA, Peters JR, Eisenlohr-Moul TA, Geiger PJ, Sauer SE. Emotion-related cognitive processes in borderline personality disorder : A review of the empirical literature. Clinical Psychology Review. 2012;*32*(5):359-369. DOI: 10.1016/j.cpr.2012.03.002

[19] Arntz A, Weertman A, Salet S. Interpretation bias in Cluster-C and borderline personality disorders. Behaviour Research and Therapy. 2011;*49*(8):472-481. DOI: 10.1016/j.brat.2011.05.002

[20] Smeijers D, Rinck M, Bulten E, van den Heuvel T, Verkes R-J. Generalized hostile interpretation bias regarding facial expressions : Characteristic of pathological aggressive behaviour. Aggressive Behavior. 2017;**43**(4):386-397. DOI: 10.1002/ab.21697

[21] Lobbestael, J., Cima, M., & Arntz, A. (2013). The relationship between adult reactive and proactive aggression, hostile interpretation bias, and antisocial personality disorder. Journal of Personality Disorders, 27(1), 53-66. https://doi.org/10.1521/pedi.2013.27.1.53

[22] Coccaro EF, Noblett KL, McCloskey MS. Attributional and emotional responses to socially ambiguous cues: Validation of a new assessment of social/emotional information processing in healthy adults and impulsive aggressive patients. Journal of Psychiatric Research. 2009;**43**(10):915-925. DOI: 10.1016/j.jpsychires.2009.01.012

[23] Coccaro EF, Fanning JR, Fisher E, Couture L, Lee RJ. Social emotional information processing in adults: Development and psychometrics of a computerized video assessment in healthy controls and aggressive individuals. Psychiatry Research. 2017;**248**:40-47. DOI: 10.1016/j.psychres.2016.11.004

[24] Gagnon J, Aubin M, Emond FC, Derguy S, Bessette M, Jolicoeur P. Neural mechanisms underlying attribution of hostile intention in nonaggressive individuals : An ERP study. International Journal of Psychophysiology. 2016;**110**:153-162. DOI: 10.1016/j.ijpsycho.2016.08.007

[25] Leuthold H, Filik R, Murphy K, Mackenzie IG. The on-line processing of socio-emotional information in prototypical scenarios: Inferences from brain potentials. Social Cognitive and Affective Neuroscience. 2012;7(4):457-466. DOI: 10.1093/scan/nsr029

[26] Gagnon J, Aubin M, Carrier Emond F, Derguy S, Fernet Brochu A, Bessette M, et al. An ERP study on hostile attribution bias in aggressive and

nonaggressive individuals. Aggressive Behavior. 2017;**43**:217-229. DOI: 10.1002/ab.21676

[27] Morey LC. Inventaire de la personnalité (translate by C. Routhier), Personality Assessment Inventory: Professional manual. Odessa, FL: Psychological Assessment Ressources; 1991

[28] Morey LC. The Personality Assessment Inventory. Dans Personality Assessment. 2nd ed. Routledge/Taylor & Francis Group; 2014. pp. 181-228

[29] Penson BN, Ruchensky JR, Morey LC, Edens JF. Using the personality assessment inventory antisocial and borderline features scales to predict behavior change: A multisite longitudinal study of youthful offenders. Assessment. 2018;**25**(7): 858-866. DOI: 10.1177/1073191116680292

[30] Derogatis LR. BSI, Brief Symptom Inventory: Administration, Scoring & Procedures Manual. National Computer Systems; 1993

[31] Gosselin M, Bergeron J. Évaluation des qualités psychométriques du questionnaire de santé mentale : SCL-90-R. Recherche et intervention sur les substances psychoactives-Québec. 1993

[32] Gasse A, Kim WS, Gagnon J. Association between depression and hostile attribution bias in hostile and non-hostile individuals : An ERP study. Journal of Affective Disorders. 2020;**276**:1077-1083. DOI: 10.1016/j.jad.2020.06.025

[33] Tone EB, Davis JS. Paranoid thinking, suspicion, and risk for aggression : A neurodevelopmental perspective. Development and Psychopathology. 2012;**24**(3):1031-1046. DOI: 10.1017/S0954579412000521

[34] Adawi M, Zerbetto R, Re TS, Bisharat B, Mahamid M, Amital H, et al. Psychometric properties of the brief symptom inventory in nomophobic subjects : Insights from preliminary confirmatory factor, exploratory factor, and clustering analyses in a sample of healthy Italian volunteers. Psychology Research and Behavior Management. 2019;**12**:145-154. DOI: 10.2147/PRBM.S173282

[35] Khalil AA, Hall LA, Moser DK, Lennie TA, Frazier SK. The psychometric properties of the brief symptom inventory depression and anxiety subscales in patients with heart failure and with or without renal dysfunction. Archives of Psychiatric Nursing. 2011;**25**(6):419-429. DOI: 10.1016/j.apnu.2010.12.005

[36] Raine A, Dodge K, Loeber R, Gatzke-Kopp L, Lynam D, Reynolds C, et al. The reactive–proactive aggression questionnaire: Differential correlates of reactive and proactive aggression in adolescent boys. Aggressive Behaviour. 2006;**32**(2):159-171. DOI: 10.1002/ab.20115

[37] Fossati A, Raine A, Borroni S, Bizzozero A, Volpi E, Santalucia I, et al. A cross-cultural study of the psychometric properties of the Reactive–Proactive Aggression Questionnaire among Italian nonclinical adolescents. Psychological Assessment. 2009;**21**(1):131. DOI: 10.1037/a0014743

[38] Gagnon J, McDuff P, Daelman S, Fournier S. Is hostile attributional bias associated with negative urgency and impulsive behaviors? A social-cognitive conceptualization of impulsivity. Personality and Individual Differences. 2015;**72**:18-23. DOI: 10.1016/j.paid.2014.08.011

[39] E-Prime (Version 2.0.10.356). [Computer Software]. Pittsburgh, PA: Psychology Software Tools; 2022

[40] Sharbrough F, Chatrian GE, Lesser R, Luders H, Nuwer M, Picton T. American Electroencephalographic Society guidelines for standard electrode position nomenclature. Clinical Neurophysiology. 1991;**8**:200-202

[41] Drisdelle BL, Aubin S, Jolicoeur P. Dealing with ocular artifacts on lateralized ERPs in studies of visual-spatial attention and memory: ICA correction versus epoch rejection. Psychophysiology. 2017;**54**(1):83-99. DOI: 10.1111/psyp.12675

[42] Preacher KJ, Hayes AF. Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. Behavior Research Methods. 2008;**40**:879-891. DOI: 10.3758/brm.40.3.879

[43] Fritz MS, MacKinnon DP. Required sample size to detect the mediated effect. Psychological Science. 2007;**18**:233-239. DOI: 10.1111/j.1467-9280.2007.01882.x

[44] Bailey CA, Ostrov JM. Differentiating forms and functions of aggression in emerging adults : Associations with hostile attribution biases and normative beliefs. Journal of Youth and Adolescence. 2008;*37*(6):713-722. DOI: 10.1007/s10964-007-9211-5

[45] Kim WS, Jolicoeur P, Gagnon J. Les effets non réciproques de l'activation du schéma hostile et non hostile sur le processus d'attribution d'intention chez les individus non agressifs. 2019. Available from: https://papyrus.bib.umontreal.ca/xmlui/handle/1866/22736

[46] Bowen K, Roberts J, Kocian E. Decision making of inmates: Testing social information processing concepts using vignettes. Applied Psychology in Criminal Justice. 2016;**2016**:1-17

[47] Coccaro EF, Fanning J, Lee R. Development of a social emotional information processing assessment for adults (SEIP-Q). Aggressive Behavior. 2017;**43**(1):47-59. DOI: 10.1002/ab.21661

[48] Gagnon J, Quansah J, Kim WS. When aggression is out of control: from one-person to two-person neuropsychology. In: Palermo S, Bartoli M, editors. Inhibitory Control Training—A Multidisciplinary Approach. IntechOpen: London, United Kingdom; 2019

Chapter 6

Perspective Chapter: The Assessment of Youth Violence

Eric Johnson and Tiffany Hollis

Abstract

Youth violence is a growing public health phenomenon that plagues communities both nationally and internationally, leading to billions of dollars in costly consequences. Youth violence ranks among the top five causes of death among youth in the United States. The development of violence risk assessment tools that identify at-risk youth measures risk factors that lead to violent behavior. In addition, some risk assessment tools identify risk-reduction interventions used to reduce the risk of future or chronic violence. More recent research has focused on individual differences in risk and resilience factors of youth. Moreover, researchers have identified both gender and ethnic differences in risk and resilience models utilized for risk reduction. However, the development and evolution of risk assessment for future violence among youth should not stagnate, as gender and ethnic differences should be incorporated into revised and new assessment tools. After carefully considering the available research, violence assessments should be refined to include gender and culturally relevant considerations to become a reliable and valid resource that is both gender and culturally inclusive and unbiased.

Keywords: youth violence, risk factors, protective factors, ethnic differences, gender differences, assessment measures

1. Introduction

Youth violence in the United States is a growing public health concern as it affects thousands of young individuals and their victims while also impacting their families, schools, and communities. The CDC defines youth violence as the intentional use of physical force to harm or threaten harm by young individuals between 10 and 24 years of age [1]. Young individuals can become involved in youth violence through perpetration, becoming the victim, or witnessing a violent act. Types of youth violence can include violent threats, fighting, bullying, sexual violence, gang violence, and even threats and physical harm with a deadly weapon. Even though youth violence can vary in type and concentration, it still negatively impacts all communities, including rural, suburban, urban, and even tribal. The CDC reports that $21 billion annually is spent on medical costs and loss of productivity due to physical assault-related injuries and homicide among youth in the United States. These costs do not include financial burdens on the criminal justice system, losses to victims, families due to psychological and social consequences, and damages to communities [1].

2. Youth violence

In the United States in 2019, out of an estimated 696,620 youth crimes, 154,060 were violent crimes [2]. However, due to the new definition of rape in the FBI database, sexual crimes are not included in the 2019 statistics. In addition, juvenile aggravated assaults and simple assaults have increased by 40% since 2010, indicating an ever-increasing problem with youth violence in the United States [2].

2.1 Estimated number of juvenile arrests, 2019

Most serious offense	Number of juvenile arrests	Percent change		
		2010-2019	2015-2019	2018-2019
All offenses	696,620	–58%	–24%	–4%
Murder and nonnegligent manslaughter	860	–15%	10%	–6%
Rape	NA	NA	NA	NA
Robbery	16,080	–41%	–13%	–7%
Aggravated assault	27,070	–40%	–6%	–3%
Burglary	20,700	–68%	–42%	–7%
Larceny-theft	83,690	–70%	–46%	–10%
Motor vehicle theft	13,610	–14%	–7%	–8%
Arson	1800	–61%	–33%	–2%
Simple assault	126,130	–40%	–4%	1%
Forgery and counterfeiting	850	–50%	–17%	–18%
Fraud	3690	–36%	–18%	–22%
Embezzlement	540	22%	–8%	–7%
Stolen property (buying, receiving, possessing)	8940	–39%	–14%	–4%
Vandalism	31,950	–59%	–23%	4%
Weapons (carrying, possessing, etc.)	16,080	–49%	–17%	–6%
Prostitution and commercialized vice	290	–73%	–51%	9%
Sex offenses (except rape & prostitution)	NA	NA	NA	NA
Drug abuse violations	81,320	–52%	–18%	–10%
Gambling	190	–86%	–60%	7%
Offenses against the family and children	3060	–19%	–11%	–8%
Driving under the influence	5570	–54%	–16%	2%
Liquor laws	26,650	–72%	–38%	1%
Drunkenness	3470	–73%	–37%	6%
Disorderly conduct	53,990	–65%	–24%	–7%
Vagrancy	350	–84%	–68%	–49%
All other offenses (except traffic)	144,160	–51%	–14%	3%
Curfew and loitering	14,650	–85%	–67%	–33%

Law Enforcement & Juvenile Crime [2].

In the United States, an estimated 20,030 male and female youth were placed into residential placement in 2019 [3]. Almost half (9797) were due to a violent crime (e.g., aggravated assault, sexual assault, etc.). Even though, to a lesser degree, female youth were responsible for 27% of violent crimes resulting in residential placement [3].

2.2 Juveniles placed in residential placement in 2019

Offense	Total	Male	Female	Total	Male	Female
Criminal homicide	941	858	83	100%	91%	9%
Sexual assault	2362	2327	35	100%	99%	1%
Robbery	4131	3883	248	100%	94%	6%
Aggravated assault	3427	2938	489	100%	86%	14%
Simple assault	3067	2231	836	100%	73%	27%
Offense	Total	Male	Female	Total	Male	Female
Burglary	2540	2350	190	100%	93%	7%
Theft	1576	1307	269	100%	83%	17%
Auto theft	1782	1491	291	100%	84%	16%
Arson	204	183	21	100%	90%	10%

Kang et al. [3].

The CDC reports that a staggering number of youth in the United States, as many as 1000 daily, are treated in emergency departments for assault-related injuries [1]. However, data indicates that violence is disproportion among specific populations. For example, research suggests that compared to heterosexual youth, sexual minority youth are at a much higher risk of experiencing multiple types of violence. In addition, while compared to white youth, African-American youth are at a much higher risk of physical forms of violence. Furthermore, homicide is the third leading cause of death among African-American youth [1].

3. Risk assessment of youth violence

Risk assessments are designed to evaluate the probability of an individual committing future acts of violence. Before the 1990s, predicting future acts of violence was comparable to flipping a coin, as it was based on unguided clinical judgment [4]. Today risk assessments have become more thorough when assessing the individual's risk of violence. While there are various tools for assessment, the Child and Adolescent Risk/Needs Evaluation (CARE-2) has the greatest validity when predicting future acts of violence [4]. When assessing, it is imperative to address an individual's environmental, individual, familial, and societal risk factors to have a multifaceted assessment [5]. Using risk assessments to evaluate violence, can predict in an individual will commit future acts of violence.

3.1 History

Over several decades, risk assessments have been adapted and redefined to portray the prediction of future acts of violence more accurately. The use of risk assessments

dates to the early 1900s and was primarily used in criminal justice agencies. Before the 1990s, risk assessments were based on the individual's marital status, employment history, and history of violence [5]. Additionally, the risk assessments were conducted solely on mentally ill, adult males who are incarcerated or in residential housing, excluding adolescent and female participants [4]. In the early 1990s, the Canadian government funded the development of more sophisticated risk assessments. The evolution of risk assessments consists of three generations, which build upon each other to create accurate and reliable data.

The first generation of risk assessments was based on professional judgments. This led to professionals relying on the training or their individual experiences to make professional judgments. Objectivity and reliability were a concern, as professional judgment can be subject to human error or biases [6]. Moving into the second generation came a more objective and structured assessment that lacks the consideration that an individual can change over time. While the early risk assessments were said to have high inter-rater reliability, they lacked Receiver Operating Characteristics (ROC) and had moderate validity [5]. However, research began to suggest that combining dynamic and static risk factors, within the assessments, is a more accurate indicator than using static factors alone. This led to the beginning of the third generation of risk assessments. Incorporating static and dynamic factors assist with the development of a treatment plan, as the dynamic factors are changeable characteristics and can be improved upon over time or through intervention. While increasing the validity of risk assessments, the more recent risk assessments prove to be harder to score and may hold less statistical value to the study of risk in youth. This implies that the development of a better scoring system for static and dynamic factors would be beneficial in providing more in-depth information [7].

During the beginning of the third generation, several conflicts began to present themselves. Researchers began to argue that less correlated items, should not be disregarded as they can assist in guiding violence reduction. This pushed the field of risk assessment to include static/dynamic factors such as intelligence versus lack of education, integrating clinical risk and resiliency items that do not equal predictability of future acts of violence [7]. Some of the current risk assessment tools include the Youth Level of Service/Case Management Inventory (YLS/CMI), Structured Assessment of Violence Risk in Youth (SAVRY), and Psychopathy Checklist: Youth Version (PCL:YV), which not only include static and dynamic factors, but interventions for adolescents. The evolution of risk assessments shifted the field toward a weighted scoring system, that allowed clinicians to assess the absence, chronicity, or severity of an individual's risk of violence (Welsh et al., 2008). An assessment that consists of a weighted system and calculates the total risk score, is the Child and Adolescent Risk/Needs Evaluation (CARE-2).

Violent behavior is often learned in the early years of an individual's life, which increases the need for awareness and prevention efforts to be in place for the youth and families. Adolescents became the focus of risk assessments, as research suggests that prevention among adolescents may reduce risk factors for violence while increasing resiliency tendencies [7]. While researching the youth risk levels, it was determined that there are three trajectories for those with violent tendencies. Youth that spends their lives in jail or rehabilitation programs are the first trajectory and has a recidivism rate of 60–80% in areas of criminal justice or substance abuse [7]. The second trajectory is short-term as the acts of these individuals generally start during the teen years and end in adulthood. Psychotherapy interventions are often beneficial for the teen trajectory group. Additionally, they also are generally not involved in

chronic or severe acts of violence [7]. Youth that suffers from a psychotic disorder or autism spectrum disorders who have been untreated is the third, and most recently added, trajectory group of violent youth. While this group is not thought to be violent; however, research has shown that youth in this group can have serious emotional outbursts [7].

Along with the shift to focusing on adolescents, professionals began to focus on risk reduction in violence. Assessing risk reductions begins with the risk assessment using evidence-based tools and allows the practitioner to focus on reducing risk factors and building resiliency factors [8]. While individualized risk assessments have improved, there are not adequate cultural considerations within the research. This is due to most of the previous research being based primarily on white imprisoned males. Incorporating cultural considerations within the research can assist in providing a more tailored assessment and reduction plan.

3.2 Risk and resilience models

Resiliency in psychological terms is defined as having the ability to maintain normal function, during or after extreme life stressors [9]. Risk factors that develop during early development can harm the child's well-being and health; however, resiliency factors can assist the child's ability to negate the effects and increase the chances of healthy development. It is that ideation that formed the resiliency theory [9]. When seeking how risk and resilience interact, there are five main models that researchers use which include, the Compensatory Model, Risk-Protective Model, Protective-Protective Model, Challenge Model, and Inoculation Model.

The Compensatory Model states that promotive factors reduce the effects of risk factors through interactive effects [10]. In the Compensatory Model risk and protective factors combine to form an outcome; however, each variable has a direct and independent effect on the outcome [11]. An example of how this model can be utilized is by comparing a child with low-self esteem to a child with high-self esteem to determine if their exposure to violence increased their likelihood of aggressive or violent behavior.

The protective factor model indicates that promotive resources can impact the relationship between risk and promotive factors and outcomes. The model contains the risk-protective model and the protective-protective model. When using the risk-protective model the assumption of promotive factors reduces the association between the risks and negative outcomes, is utilized. An example is recognizing a child with high self-esteem has a lower probability of becoming aggressive, due to exposure to violence. However, within the protective-protective model enhancing the promotive factors can be used to reduce risk and negative outcomes [12]. Within the protective-protective model, a child with low self-esteem, whose guardian has high self-esteem should positively progress, reducing risk factors and lowering the chance of aggressive behavior.

The challenge model and the inoculation model both work off the assumption that risk factors are factors leading to a negative outcome and positive coping skills lead to protective factors [13]. An example of the challenge model can be seen in an individual who went through trauma but uses positive/healthy coping mechanisms to lower their risk of a negative outcome. However, the inoculation model follows the assumption that youth will grow into their ability to deal with continued adversity [13]. This model implies that exposure to low-level risk factors assists in building protective factors that allow healthy coping skills during life stressors.

3.3 Risk and resilience factors

With years of experimental studies and research, researchers that study risk and resilience factors broke it into five-group systems of risk factors. The groups include individual, peer interaction, family, school, and community [8].

3.3.1 Individual risk factors

Negative life events	Impulsivity
Negative Attitude Toward the Future	Risk-Taking/Sensation Seeking
Internalizing Behaviors (anxiety, withdrawal)	Beliefs Supportive of Violence
Externalizing Behaviors (nondelinquent problem behaviors)	Attributional Bias
Violence Involvement	Poor Problem solving
General Delinquency Involvement	Poor Concentration
Limited Involvement in Conventional Activities	Attention Deficits
Early Violent/Aggression	Low Intelligence
Involvement in Non-Violent Crime	Low Self-esteem
Conduct Disorder/Externalizing Disorders	Lack of Empathy
Drug and Alcohol Use	Poor Social Skills

3.3.2 Individual promotive/resilience factors

Positive Social Skills	Self-efficacy for Non-violence
Sense of Hope	Sense of Purpose

3.3.3 Peer risk factors

Characteristics of Peer Networks	Affective Dimension of the Network
Association with Delinquent Peers	Commitment to Delinquent Peers
Association with Aggressive Peers	Negative/Delinquent Peer Influences
Alienation	Absence of Positive Peers
Gang Involvement	

3.3.4 Peer interaction promotive/resilience factors

Involvement with Pro-Social Peers	Role-Modeling
Positive Support	

3.3.5 Family risk factors

Poor Parental Supervision	Severe Inconsistent Discipline
Poor Parental Monitoring	Parental Attitudes Regarding Crime, violence, and substance use

Parenting Style/Hostile Family Environment	Parental Criminality/Violence
Low Attachment to Parents/Family	Physical Abuse/Neglect
Sibling Antisocial behavior	Parental Conflict
Family Structure	Parental Separation
Family Deviance	Parent/Child Separation
Lack of Parental Monitoring	Low Parental Attachment/Bonding
Lack of Clear Parental Guidelines	Delinquent Siblings
Low Parental Involvement	Large Family Size
High Parental Permissiveness	Involvement of Supervisory Services

3.3.6 Family promotive/resilience factors

Parental Warmth	Nurture and Support
Parental Presence and Monitoring	

3.3.7 School risk factors

Low Attachment to or Poor Relationships with Teachers	Low Educational Aspirations
Low School Attachment	Low Academic Achievement
Unsafe School Environment	Poor Academic Performance
Truancy	Suspension
Low Commitment to School	Frequent School Changes
Poor Quality School	Overcrowding
Poor Classroom Management	

3.3.8 School promotive/resilience factors

School Achievement	Connections to School
Positive Teacher Connection	

3.3.9 Community risk factors

Criminogenic Neighborhood Indicators (drug use, youth in trouble)	Neighborhood Residents in Poverty
Availability of Firearms	Victim of Violent Crime
High Crime Neighborhoods	Violence Exposure
Availability of Drugs and Firearms	Exposure to Racial Prejudice
Community Disorganization	Low Community Participation

3.3.10 Community promotive/resilience factors

Community Resources	Community Organization
Availability of Pro-Social Relationships	Community of Pro-Social Remodeling

While many have utilized the five-group risk/resilience factors categories, others have broken the factors into three domains including contextual, interpersonal, and individual-level domains [14]. Each of the domains includes various subcategories that encompass several levels of risk/resilience factors. Contextual factors consist of community characteristics including environment, socio-economic status, and safety. Interpersonal factors include styles of parenting and exposure to substance abuse, from peers or parents. Individual factors consist of their cognitive ability and substance use during developmental years [14]. However, other researchers use four primary risk factor domains, including individual, peer/school, family, and violent histories. The individual risk factors consist of anxiety, depression, hopelessness, high-stress level, low self-esteem, lack of self-control, inadequate coping skills, substance abuse, and high-risk behaviors. Destructive peer bonding, low level of school satisfaction, school goals not being met, inadequate peer support, and low sense of belonging, are all peer/school risk factors. Family risk factors include lack of family support, family distress, weak bonds with parent/guardian, and parental substance use. Violent history risk factors include victimization, violent behavior, or exposure to violence [15].

3.4 Conceptual patterns of individual resilience

In terms of resilience patterns, four conceptual patterns have been described in the literature dispositional, relational, situational, and philosophical [9]. Each conceptual pattern signifies different factors that may impact an individual's resilience. Dispositional patterns of resilience focus on the ego-related psychosocial attributes and attributes that support healthy dispositions toward life stressors. Some of the attributes considered are an individual's sense of autonomy, self-worth, good self-image, and being physically healthy. This pattern implies that a person with high self-esteem or a positive self-image can avoid environmental or situational risk factors. The relational pattern includes an individual's role in society and social relationships while focusing on the individual's perception of how others view them.

Situational patterns show that some adolescents can manage stress by using problem-solving skills and evaluating situations and responses. This is evaluated by pairing an individual and a stressful situation and noting their response to the situation. While the philosophical pattern focuses mainly on the individual's belief system, such as their worldview or life paradigm. The individual's belief system can power their response to stressful situations and possibly avoid risky behaviors or violent reactions.

Risk models have been utilized for various reasons; however, there are limitations to risk models as they often do not provide an accurate explanation of developmental processes and how to conduct problems develop. With that in mind, the biopsychosocial transactional development model has been suggested for at-risk youth, as it explores genetic predispositions including genetic predispositions of aggression, conduct disorder, and delinquency [16]. Among all species, males display more aggressive traits versus their female counterparts, which is an example of biopsychosocial

predispositions. Another aspect of the biopsychosocial transactional development model is the socio-cultural factors including familial, neighborhood, and subcultural aspects of development [16]. There are several theories associated with risk assessment, which causes the conflict of what assessment more accurately predicts violence in low, medium, or high-risk individuals.

The Positive Youth Development (PYD) model is another risk and resilience model, that focuses on strength-based approaches and positive characteristics [17]. The developmental assets framework reinforces the PYD model by focusing on 40 developmental assets that assist in adolescents reaching their potential. The developmental assets consist of 20 external and 20 internal assets that set benchmarks for student outcomes. External assets include support, empowerment, boundaries, and expectations, that are experienced through positive interactions with other individuals and institutions. The internal assets encompass an individual's characteristics that encourage positive internal growth including a commitment to learning, positive values, social competence, and positive identity [17]. Over the years the Positive Youth Development model has become more popular. Researchers have identified PYD as promising in reviewing programs to prevent teenage violence [18].

4. Youth subgroups

Adolescent risk factors may vary depending on their respective subgroups. A study completed internationally found that 5% of juvenile offenders committed more violent crimes when compared to adult offenders of violent crimes [19]. Additionally, 5% were more likely to be found in the lifelong trajectory of criminal activity, as it continues into adulthood. Within the 5% subgroup, there are specific family, peer, and individual risk factors that can contribute to recidivism. Family risk factors include uninvolved parenting styles, lack of empathy or support, and the absence of parents. The peer risk factors consist of peer rejection, peer deviance, and adolescent novelty seeking. Individual risk factors include low intelligence, current or previous violent behavior, personality characteristics, psychopathology, and substance abuse [19].

Adolescents involved in dating violence and victimization are another subgroup of violent youth offenders, which includes specific family, individual, and school-related risk factors [20]. A framework was constructed by Makin-Byrd et al. [20] that indicated risk factors and pathways to dating violence and victimization. Based on the framework, the first pathway suggests that adolescents who exhibit non-compliant and aggressive behavior that may lead to dating violence, have experienced harsh coercive parenting styles with a poor parent–child relationship. While the previously mentioned risk factors are still valid, the second pathway includes a generalized pattern of aggressive responses in school, which may lead to dating violence or victimization [20].

Exposure to violence is considered a core risk factor, as child abuse has an incident rate of 16% in the United States [21]. Experiencing or witnessing physical abuse during childhood can cause maladaptive thinking patterns and have a negative impact in adulthood, according to research [22]. An individual can be exposed to violence through direct victimization, physical/threatened abuse or witnessing victimization or violence. Being exposed to violence has correlated with socio-behavioral problems, including substance use, suicidal behavior/ideations, and aggressive/violent behavior [23]. Empirical evidence has shown that adverse

childhood experiences, primarily physical abuse, and future violent behavior in adulthood, have a relationship [22]. Additionally, victims of physical abuse in childhood are twice as likely to abuse their intimate partners in adulthood which is an indicator of dating violence in adolescence.

Another risk factor for future acts of violence is attachment problems or disorders. This is due to the impact it can have on an individual's empathy level. In early childhood, attachment supports the development of the brain, communication skills, and the ability to form relationships [24]. When an adolescent develops attachment, it allows the individual to learn social skills including cooperating as a group, following group rules, and adapting. However, two paths can disrupt the individual's ability to develop attachment. If a child has suffered abuse or neglect or suffers from an untreated mental illness or autism, it can inhibit the individual from bonding with caregivers. Severe problems can develop when an attachment is disrupted such as concerns with skill development, self-concept, self-management, interpersonal skills, emotional regulation, and development of pro-social values [24].

It has been suggested that parental attachment plays a key role in predicting juvenile offenses [25]. The parental attachment has been established as a primary bond between a child and society, according to the control theory. The research suggests that strong affective bonds between child–parent can deter juvenile delinquency, poor bonding is associated with juvenile delinquency, and is also a predictor [24, 25]. The weak attachment has also been linked to inadequate empathy and the commission of acts of serial violence against others [24]. Additionally, exposure to violence was linked to poor parental attachment, future acts of violence, behavioral problems, impulsivity, sexual assault, attachment disorders, poor social skills, and school behavior problems [4].

4.1 Gender differences in risk and resilience

Data obtained from the 2017 Youth Risk Behavior Study, a self-report questionnaire used by the Center for Disease Control and Prevention, shows that 30% of boys, as compared to 17% of girls, report having been in a physical fight during the previous year [26]. This research is indicative of an almost 50% higher rate of violence among males than among females, a difference which is worth consideration, considering that males and females report many of the same risk factors toward violence [27]. Socializing agents have been shown to be different among males and females. This is seen when caretakers encourage certain behaviors in adolescents such as females being encouraged in caretaking and relationship management, versus males being encouraged in autonomy, instrumentality, and goal-directed behavior [28].

While there have many studies on the risk factors of adolescents and children, few have included an adequate sample of female subjects to draw conclusions concerning the moderating role of gender when the other, known risk factors remain constant [27]. Studies which do study gender tend to do so as a primary risk factor, rather than as a moderating risk factor in the commission of violent crimes. This remains true in recent literature, despite findings that certain risk factors, such as trauma, being the victim of a violent act and being involved in a dysfunctional relationship carry much more weight in females as a precursor to committing violent acts than they do among males [29]. The fact that few studies include an adequate representation of females or consider differences in how various risk factors affect females versus males lessens the validity of these studies when attempting to develop a theory of risk factors among females [30].

Among females, being the victim of violence in the home is likely to cause revictimization later in life, while in males, it is likely to lead to violence against others [29]. Female youth who grow up in a home with an absent or abusive father are much more likely to be the victim of dating violence as adolescents and young adults [31]. Males in the same situation are more likely to act out violently against others [31]. In single family or abusive/neglectful families, children are much more likely to become involved in alcohol or drugs, which increased the risk of behaving violently in both genders, and of female youth being victimized, particularly by a romantic or dating partner [31].

Males are often more likely to be perpetrators and victims of physical bullying than females [32]. Males are often socialized into coping with anger through aggression in an overt or physical way, while females often respond to anger by inflicting aggression on others personal relationships or psychological wellbeing [33]. This suggests that parents who reinforce aggression, physically or verbally, as a method of managing anger or negative emotions, can increase the chances the adolescent using aggression or violence in the future. However, research is limited on the correlation of cause of violent behavior and gender differences.

Poverty seems to affect both male and female youth negatively, but in different ways. While poverty-stricken male youth tend to act out violently against others, female youth are at an increased risk of being victimized by others [31]. This is particularly true if they are raised in a family where the father is either absent or is abusive to the mother and/or the children [31]. Females tend to internalize abuse, while males tend to act out against others when they have been the victims of abuse [31]. Females blame themselves; males blame the abuser—it affects them differently, but still makes both groups more likely to either abuse others or to be the victims of further abuse [31].

4.2 Ethnic differences in risk and resilience

When predicting future acts of aggression or violence, previous research lacked knowledge concerning risk and protective factors associated with racial or cultural differences. A recent study compared violent trends in adolescents among the Mexican, Puerto Rican, Cuban, Non-Latino Black, and Non-Latino White adolescents. The results indicated that White youth were at the lowest risk, while Puerto Rican youth are at the highest risk of perpetrating severe violence, compared to the other ethnicities included in the study [34]. While each ethnicity carries its own set of risk and protective factors, some factors can have an impact on all adolescents regardless of cultural or ethnic differences. Being a witness or victim of violence at home or among peers has proven to put youth at increased risk of involvement in acts of violence. Abuse in early childhood has been proven to desensitize youth to violence, making it appear appropriate to use violence as a solution to a conflict [35]. Additionally, adolescents with gang affiliations are more susceptible to violent acts, when compared to those without affiliations [35]. Seeley's (2010) research also suggested that Latino youth are more likely to be involved in a gang, followed by Non-Latino Black, and Non-Latino White youth. The following sections will discuss the risk and resilience factors of African American, Latino, and White adolescents.

4.3 Risk and resilience factors in white youth

The risk and resilience factors White adolescents face are similar to those in other ethnic groups but are often overlooked. Adolescents who are from single-parent or

abusive homes increase the possibility of violent behavior (CDCP, 2012). The chances are greater for acts of violence or gang involvement, in White adolescents who participate in drug or alcohol use. Additionally, white male adolescents in abusive or violent households can be an indicator of future violent behavior, while females are more likely to become involved in violent relationships (CDCP, 2012). The top indicator for future acts of violence among White adolescents is parental neglect/absence and violence (CDCP, 2012). Homicide is one of the leading causes of death among White adolescents [36]. White youth is less likely to die from homicide than African American or Latino youth, due to peer/gang violence. It is more likely for White youth to die because of familial abuse or neglect when compared [36].

4.4 Risk and resilience factors in African American youth

African American and Hispanic adolescents have a higher risk of being involved in acts of violence, resulting in social sequelae, negative health impacts, incarceration, and homicide, according to research [8]. Death is the leading cause of death in African American adolescents. A study published by Stoddard et al. [8], found that three-fourths of the urban youth population reported peer violence to the emergency department. Urban stress and mental health perspectives are that African American youth are affected because of discrimination, racism, and stress-inducing factors, including oppression, expansion of drugs, using violence as a solution to a problem, and greater exposure to violence [37]. Approximately 79% of violent crimes occur in urban communities, with 80–90% of urban youth witnessing or being a victim of a violent crime [37]. Youth exposed to abuse or violent crimes are more likely to present aggressive behaviors and potentially become victimizers. Along with a primary parental figure(s) having a substance abuse problem or neglectful can dramatic Discrimination and oppression have been a reoccurring risk factor for future acts of violence, in the African American culture. The impact of discrimination and oppression has resulted in many internalizing racist attitudes, leading to mutual disrespect, internal communal conflict, and Black-on-Black violence [38]. African Americans are not among the only minority populations to be victims of discrimination or oppression, but there is a lack of research on other ethnic groups and the impact it has made on their culture.

However, strong ethnic identity and high self-esteem have been identified as resilience factors. Resilience factors aid in reducing internalizing behaviors and create better-coping skills and problem-solving strategies. Additional resilience factors among the African American youth include strong family presence, spiritual/religious beliefs, and positive social involvement. Research has suggested that youth involved in extracurricular activities through the church, school, or community organizations is a positive deterrent from violent behavior in all cultures [39]. Many extracurricular activities involve guidelines or rules to be able to continue participation, holding the adolescents accountable for their actions or behaviors. Family, including extended family, plays a major role in many African American adolescents' lives. Many reporting to have several caregivers throughout development, implying a strong support system [40]. Research has found that parenting style can be a risk or protective factor for chronic violence. For example, controlling parenting styles among African American households tend to be adaptive and protective within high-risk environments which suggests that a controlling parenting style may assist in African American youth to recover from committing assaultive behavior [41].

4.5 Risk and resilience factors in Latino youth

Within the research, the Latino/Hispanic populations are inadequately represented as many of the studies are broken down into Caucasian, African American, or Other. Individuals of the Latino population have their own distinct risk and protective factors. The Latino population is growing rapidly compared to other ethnic groups, due to immigration and the high rate of family growth (CDCP, 2012). Studies have suggested that acculturation and speaking Spanish at home are important protective factors to keep in mind when considering future acts of violence [42]. This is an important consideration due to some households only speak Spanish and do not learn the English language, this makes it difficult for their children in academic and social situations. Low academic achievements are commonly attributed to living in poverty, which increases the likelihood of being exposed to violence [36]. Latino adolescents who have positive role models of their own or from other cultures are less likely to become involved in violent behavior. Resilience factors among the Latino population include positive peer relations, academic achievements, communication skills, and living above poverty [34].

The Latino community has been identified as having high levels of parental involvement and belonging to peer groups, which unlike other ethnicities has been found to be a risk factor [43]. Studies suggest that many parents in the Latino community are reluctant to trust those of other cultures and resist accepting or seeking beneficial assistance for their children. However, the Latino youth has shown a greater acceptance of help, implying that parental involvement inhibits Latino youth from seeking help from non-Latino individuals or entities [44]. While a strong ethnic identity is important for the self-esteem it can be beneficial to Latino youth to interact with individuals of multiple cultures as it prevents involvement in violent behaviors, while promoting a sense of community. Research has suggested that large peer groups of predominantly one race can lead to an increased chance of gang involvement or other criminal behavior [44]. Homicide is the second leading cause of death among the Latino population, with accidental injury being the first (CDCP, 2012). Research must be continued to determine risk and protective factors among the Latino population and to form preventative measures for the betterment of the Latino population's emotional and physical wellbeing.

5. Assessment measures for youth violence

There have been several assessments created for clinicians and researchers to predict future acts of violence within the youth. Prominent assessment tools include the ability to weigh strengths/weaknesses with multicultural factors considered, including age, culture, and gender, along with proven reliability and validity. While evaluating several risk assessments, the Child and Adolescent Risk/Needs Evaluation (CARE-2) is the strongest predictive tool, when comparing reliability/validity rates [4]. The following will discuss an overview of the more prominent risk assessments, that are currently available for predicting future acts of violence.

5.1 The child and adolescent risk/needs evaluation (CARE-2)

The child and adolescent risk/need evaluation (CARE-2) examines risk factors that may impact a child or adolescent's development and assists in developing a

plan for youth to grow into becoming pro-social members of society. The CARE-2 assessment model is based on an atheoretical risk-resilience model. Additionally, for a risk assessment tool to have validity, it should present a range between 75 and 85% Receiver Operating Characteristics (ROC). The CARE-2 assessment predictive validity has been reported at 75–94% (ROC) for males and 67–97% (ROC) for females, which is above the SAVRY, PCL-YV (male), PACT, and LS-CMI assessments predictive validity rate [4]. This assessment tool can assess by age group and gender while predicting chronic violence. The limitation behind this assessment is that it does not have a strong statistical foundation and does not address specific ethnic risk or resilience factors.

5.2 Youth level of service/case management inventory (YLS/CMI)

Youth Level of service/case management inventory (YLS/CMI) is a tool based on the atheoretical risk-resilience interaction model. It combines a risk/needs assessment and a case management tool into a system derived from the Level of Service Inventory-Revised (LSI-R) tool. The YLS/CMI is often utilized by probation officers, youth workers, psychologists, and social workers, as it identifies the youth's needs, strengths, barriers, and incentives, allowing the professional to select appropriate goals for the individual, producing an effective case management plan (Hoge & Andrews, 2016). While the YLS/CMI system is a risk reduction tool based on research. However, the assessment does not assess by age or gender or incorporate ethnic risk or resilience factors. With the limitations in mind, the YLS/CMI would not be appropriate for predicting or assessing violent patterns [45]. The assessment does have moderate validity for recidivism.

5.3 Structured assessment of violence in youth (SAVRY)

The SAVRY is based on the Structured Professional Judgment model, and is not designed to be a formal test, but more a structured interview without statistical designation or scores. The SAVRY consists of three risk domains broken into 24 items, the domains include Historical Risk Factors, Social/Contextual Risk Factors, and Individual/Clinical Factors. The SAVRY assessment follows clear definitions of risk and protective factors, addressing the primary domains. Within the assessment, each risk factor is rated with a three-level structure, while the six protective factors are rated by present or absent, all of which have specific rating guidelines. Additionally, reactive, and proactive aggression is theoretically supported and emphasized [46]. Childs et al. [47], suggested that the SAVRY shows appropriate measures of reliability and validity; however, it does not take into account cultural considerations in youth. Another limitation is that SAVRY excludes children and young adolescents and focuses on risk and resilience in adolescents.

5.4 Psychopathy checklist: youth version (PCL:YV)

The Psychopathy Checklist: Youth Version (PCL:YV) was created by Robert Hare in the 1970s and has been revised into the PCL-R, which was published in 2003 and is often used as a tool to measure psychopathy that is used in research [48]. The PCL:YV assists with identifying patterns of cheating, fighting, bullying, and antisocial behaviors in adolescents/youth. Determining the patterns of traits can be crucial for the individuals developing into adulthood (Forth et al., 2016). The PCL:YV can be

utilized to understand contributing factors to antisocial behavior and psychopathy in adulthood. Within the PCL:YV follows an expert-rater that emphasizes the need for multidomain and multisource information (Forth et al., 2016). While the PCL:YV tests high on validity standards, the focus is on predicting antisocial or sociopathic behaviors, assisting in predicting violent behavior in the future. However, there is a limit on youth age groups.

5.5 Screening tool for the assessment of young sexual offenders' risk (STAYSOR)

The STAYSOR consists of 11 dichotomous and static-historical items and is considered a self-constructed risk assessment tool. The research emphasized that there is the relevance of psychological abnormalities in juvenile sexual offenders [49]. There are four items included in the assessment such as prior sexual offenses, current convictions of any offense, any stranger victim, and any male victim, which are adaptions from the STATIC-99 [50]. While the STRAYSOR has proven to be a useful tool for predicting sexual violence, however, it would not be a reliable tool for predicting nonsexual violent acts. This instrument relies on behaviors without considering risk or resilience factors, limiting the predictive ability of youth without previous convictions or offenses.

5.6 Structured assessment of protective factors for violence risk (SAPROF)

The SAPROF was developed specifically for assessing protective factors in adult offenders and is often used in addition to a risk-focused Structured Professional Judgment (SPJ) tool, such as the HCR-20 or HCR-20 V3. Included in the SAPROF are 17 protective factors, 15 of which are dynamic factors making them important treatment evaluation and target measures that are rated on a three-point scale. The SAPROF is suitable for previous violent and sexual offenders [51]. While the SAPROF assessment has shown to be inappropriate for children or youth, it proves to be a reliable predicting tool for adult offenses. However, the assessment has shown to have more validation when used on male offenders, as the research completed on the use with females lacks strong empirical evidence. Additionally, it focuses primarily on protective factors excluding many risk factors beneficial in predicting violence.

5.7 Reynolds adolescent adjustment screening inventory (RAASI)

The RAASI is a self-reported measuring tool indicating the clinical severity of domains of psychological adjustment problems and assessing the frequency and symptom of adjustment problems. 32 items within this assessment tool are derived from the Adolescent Psychopathology Scale (APS) [52]. The RAASI provides an Adjustment tool along with four factorial-derived scales that provide specificity to an adolescent's Adjustment problem. The scales include antisocial behavior, anger control, emotional distress, and positive self. Generally, the RAASI is utilized in residential settings and has shown inappropriate for predicting violence in a community, home, or school setting.

5.8 The strengths and difficulties questionnaire (SDQ)

The Strengths and Difficulties Questionnaire measures emotional symptoms, conduct problems, attention/hyperactivity, peer relationship concerns, and prosocial

behaviors, in youth ages 3–16 years old. The questionnaire can be used for screening, assessment, and evaluation, and can be completed and scored online [53]. This assessment tool is appropriate for screening violent behavior; however, it lacks multicultural considerations.

5.9 Youth violence risk assessment tools

The table below summarizes the leading Risk Assessment Tools by Aspect.

Aspect	CARE-2	YLS/CMI	PCL/YV	SAVRY	STAYSOR	SAPROF
• Risk/resilience • Factors based on research	X	X	X	X		X
• Assesses by Age Group	X					
• Assesses by Gender	X					
• Risk Assessment/Reduction Tool	X	X	X		X	X
• Predicts Chronic Violence	X		X			
• Incorporates Ethnic Risk Factors						
• Incorporates Ethnic Resilience Factors						
• Based on a 5 Domain Model						
• Atheoretical Risk-Resilience Interaction Model	X	X		X		X

6. Conclusion

Despite various research displayed, there is inadequate research regarding the risk and resilience factors for youth in various areas. Based on research provided the CARES-2 assessment tool is currently the most effective in predicting youth violence; however, it can be improved by adding cultural and ethnic considerations. Stripping the current weights of the CARE-2 assessment to better accommodate African American and White groups, while incorporating a method to determine gender variations among ethnicity and gender. Additionally, for the Latino group a recommendation is to complete a Spearman's rho nonparametric correlation on the Latino group and evaluate the difference of risk and resilience factors within the CARE-2. Building new risk and resilience and reorganizing the CARE-2 into five subdomains including individual, peer interaction, family, school, and community, would allow a more detailed picture of the assessed individuals factors. The final recommendation is to develop new item within the CARE-2 that reflect ethnic-specific risk factors such as discrimination, oppression, racism, and stress inducing factors, along with resilience factors such as self-esteem and strength of their cultural identity. Developing an assessment that has proven reliability and validity for predicting violence will require more research. It is crucial when developing the assessment it causes no harm emotionally, legally, or physically.

DOI: http://dx.doi.org/10.5772/intechopen.106069

Author details

Eric Johnson* and Tiffany Hollis
Wilmington University, Seaford, USA

*Address all correspondence to: ejohnson@cmwsllc.com

References

[1] Center for Disease Control and Prevention. Preventing youth violence. US Department of Health and Human Services; Atlanta, GA. 2021. Available from: https://www.cdc.gov/violenceprevention/youthviolence/fastfact.html

[2] Law Enforcement & Juvenile Crime. OJJDP Statistical Briefing Book. (n.d.). Available from: https://www.ojjdp.gov/ojstatbb/crime/qa05101.asp?qaDate=2019 [Accessed: April 4, 2022]

[3] Kang W, Sickmund M, Sladky TJ, Puzzanchera C. Easy Access to the Census of Juveniles in Residential Placement. 2021. Available from: https://www.ojjdp.gov/ojstatbb/ezacjrp/. [Accessed: April 4, 2022]

[4] Seifert K. Research on youth violence risk/needs assessments. Journal of Psychology and Clinical Psychiatry. 2015;**3**(1):1-6. DOI: 10.15406/jpcpy.2015.03.00115

[5] Spies RA, Carlson JF, Geisinger KF, editors. The eighteenth mental measurements yearbook. Lincoln, NE: Buros Center for Testing; 2010

[6] Bureau of Justice Assistance. History of risk assessment. In: Bureau of Justice Assistance. U.S. Department of Justice; n.d. Available from: https://bja.ojp.gov/program/psrac/basics/history-risk-assessment

[7] Bushman BJ, Newman K, Calvert SL, Downey G, Dredze M, Gottfredson M, et al. Youth violence: What we know and what we need to know. American Psychologist. 2016;**71**(1):17. DOI: 10.1037/a0039687

[8] Stoddard SA, Whiteside L, Zimmerman MA, Cunningham RM, Chermack ST, Walton MA. The relationship between cumulative risk and promotive factors and violent behavior among urban adolescents. American Journal of Community Psychology. 2013;**51**(1-2):57-65. DOI: 10.1007/s10464-012-9541

[9] Van Breda AD. Resilience Theory: A Literature Review. Pretoria, South Africa: South African Military Health Service; 2001

[10] Garmezy N, Masten AS, Tellegen A. The study of stress and competence in children: A building block for developmental psychopathology. Child Development. 1984;**55**(1):97-111. DOI: 10.2307/1129837

[11] Hollister-Wagner GH, Foshee VA, Jackson C. Adolescent aggression: Models of resiliency. Journal of Applied Social Psychology. 2001;**31**(3):445-466. DOI: 10.1111/j.1559-1816.2001.tb02050.x

[12] Zimmerman MA. Resiliency theory: A strengths-based approach to research and practice for adolescent health. Health Education & Behavior: The Official Publication of the Society for Public Health Education. 2013;**40**(4):381-383. DOI: 10.1177/1090198113493782

[13] Fergus S, Zimmerman MA. Adolescent resilience: A framework for understanding healthy development in the face of risk. Annual Review of Public Health. 2005;**26**:399-419. DOI: 10.1146/annurev. publhealth.26.021304.144357

[14] Reingle JM, Jennings WG, Lynne-Landsman SD, Cottler LB, MaldonadoMolina MM. Toward an understanding of risk and protective factors for violence among adolescent boys and men: A longitudinal analysis.

Journal of Adolescent Health. 2013;**52**(4):493-498. DOI: 10.1016/j.jadohealth.2012.08.006

[15] Logan-Greene, P., Nurius, P. S., Herting, J. R., Hooven, C. L., Walsh, E., & Thompson, E. A. (2011). Multi-domain risk and protective factor predictors of violent behavior among at-risk youth. Journal of Youth Studies, 14(4), 413-429. https://doi.org/10.1080/13676261.2010.538044

[16] Dodge KA, Pettit GS. A biopsychosocial model of the development of chronic conduct problems in adolescence. Developmental Psychology. 2003;**39**(2):349 Available from: http://www.apa.org/pubs/journals/dev/

[17] Edwards OW, Mumford VE, Serra-Roldan R. A positive youth development model for students considered at-risk. School Psychology International. 2007;**28**(1):29-45. DOI: 10.1177/0143034307075673

[18] Schulman S, Davies T. Evidence of the Impact of the 'Youth Development' Model on Outcomes for Young People. A Literature Review. 2007. Available from: http://www.timdavies.org.uk

[19] Mulder E, Brand E, Bullens R, Van Marle H. A classification of risk factors in serious juvenile offenders and the relation between patterns of risk factors and recidivism. Criminal Behaviour and Mental Health. 2010;**20**(1):23. DOI: 10.1002/(ISSN)1471-2857

[20] Makin-Byrd K, Bierman KL, Conduct Problems Prevention Research Group. Individual and family predictors of the perpetration of dating violence and victimization in late adolescence. Journal of Youth and Adolescence. 2013;**42**(4):536-550. DOI: 10.1007/s10964-012-9810-7

[21] Child Welfare Information Gateway. Child Maltreatment 2019: Summary of Key Findings. U.S. Department of Health and Human Services, Administration for Children and Families, Children's Bureau; 2021 Available from: https://www.childwelfare.gov/pubs/factsheets/canstats/

[22] Maxwell K, Callahan JL, Ruggero CJ, Janis B. Breaking the cycle: Association of attending therapy following childhood abuse and subsequent perpetration of violence. Journal of Family Violence. 2016;**31**(2):251-258. DOI: 10.1007/s10896-015-9765-z

[23] Zimmerman GM, Posick C. Risk factors for and behavioral consequences of direct versus indirect exposure to violence. American Journal of Public Health. 2016;**106**(1):178-188 Retrieved from http://ajph.aphapublications.org/

[24] Seifert K. Attachment and the development of relationship skills. Journal of Psychology and Clinical Psychiatry. 2016;**5**(2):1-9. DOI: 10.15406/jpcpy.2016.05.00281

[25] Schroeder RD, Higgins GE, Mowen TJ. Maternal attachment trajectories and criminal offending by race. American Journal of Criminal Justice. 2014;**39**(1):155-171. DOI: 10.1007/s12103-012-9192-0

[26] Redfield R, Schuchat A, Dauphin L, et al. Youth risk behavior surveillance, United States 2017. MMWR Surveillance Summaries. 2018;**67**(8)

[27] Penney SR, Lee Z, Moretti MM. Gender differences in risk factors for violence: An examination of the predictive validity of the Structured Assessment of Violence Risk in Youth. Aggressive Behavior. 2010;**36**(6):390-404. DOI: 10.1002/ab.20352

[28] Keenan K, Shaw D. Developmental and social influences on young girls' early problem behavior. Psychological Bulletin. 1997;**121**(1):95. DOI: 10.1037/0033-2909.121.1.95

[29] Salisbury EJ, Van Voorhis P. Gendered pathways: A quantitative investigation of women probationers' paths to incarceration. Criminal Justice and Behavior. 2009;**36**(6):541-566. DOI: 10.1177/0093854809334076

[30] Pulkkinen L. Life-styles in personality development. European Journal of Personality. 1992;**6**:139-155. DOI: 10.1002/per.2410060206

[31] Hicks KF. Violence in adolescence. Child Psychology Journal. 2012;**2**(1):3-15

[32] Carbone-Lopez K, Esbensen FA, Brick BT. Correlates and consequences of peer victimization: Gender differences in direct and indirect forms of bullying. Youth Violence and Juvenile Justice. 2010;**8**:332-350. DOI: 10.1177/1541204010362954

[33] Letendre J. "Sugar and spice but not always nice": Gender socialization and its impact on development and maintenance of aggression in adolescent girls. Child and Adolescent Social Work Journal. 2007;**24**(4):353-368. DOI: 10.1007/s10560-007-0088-7

[34] Estrada-Martínez LM, Padilla MB, Caldwell CH, Schulz AJ. Examining the influence of family environments on youth violence: A comparison of Mexican, Puerto Rican, Cuban, non-Latino Black, and non-Latino White adolescents. Journal of Youth and Adolescence. 2011;**40**(8):1039-1051. DOI: 10.1007/s10964-010-9624-4

[35] Seeley JJ. Violence in adolescents. Journal of Psychology and Clinical Psychiatry. 2010;**4**(12):37-52

[36] Stone RAT, Meyler D. Identifying potential risk and protective factors among non-metropolitan Latino youth: Cultural implications for substance use research. Journal of Immigrant and Minority Health. 2007;**9**(2):95-107. DOI: 10.1007/s10903-006-9019-5

[37] McGee Z. Risk, protective factors, and symptomatology among urban adolescents: Findings of a research study on youth violence and victimization. Journal of Offender Rehabilitation. 2015;**54**(6):429-444. DOI: 10.1080/10509674.2015.1056902

[38] McMahon SD, Watts RJ. Ethnic identity in urban African American youth: Exploring links with self-worth, aggression, and other psychosocial variables. Journal of Community Psychology. 2002;**30**(4):411-431. DOI: 10.1002/jcop.10013

[39] Fredricks JA, Eccles JS. Participation in extracurricular activities in the middle school years: Are there developmental benefits for African American and European American youth? Journal of Youth and Adolescence. 2008;**37**(9):1029-1043. DOI: 10.1007/s10964-008-9309-4

[40] Hall CH. Kinship ties: Attachment relationships that promote resilience in African American adult children of alcoholics. Advances in Social Work. 2007;**8**(1):130-140 Available from: https://journals.iupui.edu/index.php/advancesinsocialwork

[41] Copeland-Linder N, Lambert SF, Ialongo NS. Community violence, protective factors, and adolescent mental health: A profile analysis. Journal of Clinical Child and Adolescent Psychology. 2010;**39**(2):176-186

[42] Reingle JM, Jennings WG, Maldonado-Molina MM. The mediated effect of contextual risk factors on

trajectories of violence: Results from a nationally representative, longitudinal sample of Hispanic adolescents. American Journal of Criminal Justice. 2011;**36**(4):327-343. DOI: 10.1007/s12103-011-9138-y

[43] Shetgiri R, Kataoka SH, Ryan GW, Askew LM, Chung PJ, Schuster MA. Risk and resilience in Latinos: A community-based, participatory research study. American Journal of Preventative Medicine. 2009;**37**(6):S217-S224. DOI: 10.1016/j.amepre.2009.08.001

[44] Rodriguez MA, Brindis CD. Violence and Latino youth: Prevention and methodological issues. Public Health Reports. 1995;**110**(3):260

[45] Bechtel K, Lowenkamp CT, Latessa E. Assessing the risk of re-offending for juvenile offenders using the youth level of service/case management inventory. Journal of Offender Rehabilitation. 2007;**45**(3-4):85-108. DOI: 10.1300/J076v45n03_04

[46] Borum R, Bartel PA, Forth AE. Structured assessment of violence risk in youth. In: Grisso T, Vincent G, Seagrave D, editors. Mental Health Screening and Assessment in Juvenile Justice. New York, NY: The Guilford Press; 2005. pp. 311-323

[47] Childs KK, Ryals J, Frick PJ, Lawing K, Phillippi SW, Deprato DK. Examining the validity of the Structured Assessment of Violence Risk in Youth (SAVRY) for predicting probation outcomes among adjudicated juvenile offenders. Behavioral Sciences & the Law. 2013;**31**(2):256-270. DOI: 10.1002/bsl.2060

[48] Forth A, Brazil K. Psychopathy Checklist: Youth Version (PCL:YV). 2019. Available from: https://www.researchgate.net/deref/http%3A%2F%2Fdx.doi.org%2F10.4135%2F9781483392240.n384

[49] Klein V, Yoon D, Briken P, Turner D, Spehr A, Rettenberger M. Assessment of accused juvenile sex offenders in Germany: A comparison of five different measures. Behavioral Sciences & the Law. 2012;**30**(2):181-195. DOI: 10.1002/bsl.2006

[50] Anderson D, Hanson RK. Static-99: An actuarial tool to assess the risk of sexual and violent recidivism among sexual offenders. In: Otto RK, Douglas KS, editors. Handbook of Violence Risk Assessment. Oxford, UK: Routledge; 2009. pp. 251-226

[51] de Vogel V, de Vries Robb'e M, de Ruiter C, Bouman YH. Assessing protective factors in forensic psychiatric practice: Introducing the SAPROF. International Journal of Forensic Mental Health. 2011;**10**(3):171-177. DOI: 10.1080/14999013.2011.600230

[52] Reynolds WM. Reynolds Adolescent Adjustment Screening Inventory Professional Manual. Odessa, FL: Psychological Assessment Resources; 2001

[53] Carchedi S. Measures for Screening, Assessment, and Evaluating Practice. 2013. Available from: http://www.schoolsocialwork.net/tools-for-screening-assessment-and-evaluating-practice/

Chapter 7

Negative Urgency and Its Role in the Association between Image Distorting Defensive Style and Reactive Aggression

Paul McNicoll, David Richard and Jean Gagnon

Abstract

Although the association between immature defensive styles to protect oneself from conflict in emotional context and reactive aggression (RA) has been shown recently among nonclinical individuals, the factors that may explain this relationship remain poorly understood. One putative factor is negative urgency as impulsive individuals tend to react aggressively in emotional contexts. This study aims to verify whether the relationship between image distorting defensive style and RA is moderated and not mediated by negative urgency of trait impulsivity. Nonclinical participants completed the Defensive Style Questionnaire, the UPPS Impulsivity Behavior Scale, and the Reactive-Proactive Aggression Questionnaire. Contrary to what was expected, the results showed that the relationship between image distortion and RA was entirely mediated but not moderated by the effect of negative urgency. These results suggest that when individuals get in a defensive state leading to a distortion of the image of themselves and others, they become more emotionally impulsive, leading to RA.

Keywords: impulsivity trait, reactive aggression, defensive style, moderation, mediation, negative urgency

1. Introduction

Aggressive behavior has an evolutionary root, sometimes adapted, sometimes maladapted, which has kept its place in the development of society and humans through natural selection, not to mention its main function of survival. Through the conceptualization of aggression, several variants have been defined, including reactive aggression (RA). The latter is known to manifest itself in response to a frustrating situation or a provocation. It is characterized by a hostile and protective response [1]. In other words, RA is commonly described as impulsive and unplanned. It usually occurs when experiencing negative feelings [2]. In addition, this type of behavioral reaction constitutes the main type of aggression [3]. RA can oppose proactive aggression, which is a type of intentional aggression regulated by external reinforcers. The conceptualization of RA is central to the integrative cognitive model of RA [4], which

states that individuals who are more emotionally reactive and who present high anger traits tend to interpret ambiguous social situations as hostile. The cognitive origins of RA seem to come from certain difficulties in information processing, according to the Social Information Processing model of Crick and Dodge [1]. According to Raine and Dodge [5], deficits like these could stem from symptoms underlying perceptual cognitive functions in the schizotypal personality type, such as reference ideas, unusual perceptual experiences, and paranoid ideation. This is what the results of their study demonstrate: reactive children have salient characteristics of the spectrum of schizophrenia and tend to be more impulsive and anxious [5]. An abusive environment, including child abuse and difficult parenting, as well as temperamental traits, such as impulsiveness, hostility, anger reactivity, emotional dysregulation, and anxiety, can be strongly linked to RA (Vitaro and Brendgen [6] seen in Maneiro and Cutrín [7]). An important psychological mechanism contributing to RA is response inhibition [8]. Several studies on reactive aggressive adolescents have highlighted a deteriorated response inhibition in them (Zhang et al. [9], Hecht and Latzman [10], seen in Sun et al. [8]). Additionally, from a neurological perspective, RA appears to be correlated with amygdala size [11], a key region in the negative emotion processing [12]. A meta-analysis by Mincic [13] and data from structural magnetic resonance imaging demonstrate a more accurate picture of this link by arguing that the size of the right amygdala is well correlated with negative emotion processing [11]. All in all, and in accordance with several existing theoretical frameworks, it seems that RA is a complex phenomenon that finds its roots in a diffuse system of psychosocial, biological, and cognitive factors.

The hierarchical classification of defense mechanisms by Vaillant [14] is one of the most recognized attempts to classify the different defense mechanisms. This classification is divided into four distinct categories of defenses: 1) psychotic, 2) immature, 3) neurotic, and 4) mature. Within this categorization, it is possible to subdivide immature defenses into two different categories, namely depressive and non-depressive defenses. It is within the depressive ones that we find the defense mechanisms associated with the images distorting defensive style [15]. As for the minor defenses, it is a question of temporarily reinforcing the self-image by the abstraction of any threatening material for the individual to protect the self from negative and devaluing feelings, such as low self-esteem or a feeling of weakness. However, these distortions are not as diffuse as those present in major defenses and do not increase adaptation to stressors [16]. In return, the major defenses allow the protection of the self against intolerable anxiety at the moment when the anxiety-provoking objects are activated (e.g., the threat of being punished, abused, or killed). Subsequently, the individual processes these distortions as being consistent with his/her own subjective perception. On the other hand, simplifying oneself or another excessively (e.g., reducing a person to something intrinsically bad) and reacting according to this alteration causes others to react negatively [16]. Thus, a two-way relationship is established between the person and his/her entourage, leading them to influence each other in their interactions and reactions.

Among the defense mechanisms that contribute to image distorting defensive style, those of interest for us are splitting (failure to reconcile positive and negative attributes, in a global understanding of a person or a situation, which leads to an all-or-nothing thought), projection (the person perceives their thoughts as coming from an external source), projective identification (parts of the self and internal objects are split off and projected into the external object, which then becomes possessed, controlled, and identified with the projected parts) [15, 17]. Unlike projection, the

latter does not refuse to recognize the impulse but falsely attributes it as being a justifiable reaction of the other [15]. The other defense mechanisms of interest help rejecting complaining (repetitive use of a complaint or a series of complaints in which the subject ostensibly asks for help and expresses the anger as an indirect reproach as not good enough, while continuing to ask for more of it) and reaction formation (replacing his/her initial impulse toward a situation or an idea by the opposite impulse) [15]. Splitting can alternate between devaluation (over-attributing negative attributes to self or others) and idealization (over-attributing positive attributes to oneself or others) [15]. In general, these immature defense mechanisms have the main function of protecting the self-esteem of the person who uses them unconsciously by using various forms of affect displacement and image distortion [15].

Previous research on aggression has demonstrated strong relationships between image distorting style and aggression [18–20]. Specifically, the results of a study investigating defense mechanisms and suicide (which can be considered a form of self-harm/auto-aggression) indicate a significant association between the use of this defensive style and the risk of committing a suicide attempt [18]. In the same vein, in a study carried out among groups of participants with a borderline personality disorder (a psychopathology known to make extensive use of image distorting style and for impulsive and aggressive behaviors [21]), who had either already committed suicide attempts or not, the splitting of the image of others was one of the factors significantly influencing suicide attempts [20]. In parallel, a previous study reported a robust association between image distorting style and the propensity to react aggressively to frustrating or provocative situations [19]. Taken together, these results suggest that using this defensive style may increase the propensity of an individual to react aggressively, either to themselves or to others. Thus, it is important to ask how seeing others or oneself as all good or all bad could lead to RA? How could projecting our negative internal states onto others lead to this type of behavior? The literature demonstrates there is a gap in our knowledge regarding the explanation of the link between image distorting style and RA, particularly in what context this association exists. It is plausible to think that the impulsive tendencies of individuals would be a potential factor in explaining this link, given the fact that overall impulsivity is found to be associated with RA [7].

Impulsivity is a predisposition to rapid and unplanned reactions to internal or external stimuli without consideration of the negative consequences of these reactions on the impulsive individual or on others [22]. In an attempt to conceptualize the impulsivity trait in Whiteside and Lynam [23], the authors extracted four factors that can make up this trait: 1) sensation seeking, 2) lack of perseverance, 3) lack of planning, and finally 4) urgency. The urgency trait, whether positive or negative, is similar to the impulsivity facet of neuroticism [24]. The negative urgency (NU) personality trait is defined as an individual's disposition to initiate reckless behaviors when the latter experiences negative affects [24]. In contrast, positive urgency is defined as the tendency to act recklessly when experiencing intense positive affective state. Nonetheless, NU has been reported to be the best predictor of severity of medical, drug, employment, family, social, alcohol, legal, and psychiatric problems in individuals with substance dependencies [25]. Indeed, NU predicts heavy alcohol consumption in highly depressed individuals and is correlated with heavy alcohol intoxication in individuals with high levels of anxiety [26, 27]. Moreover, among people who score high on the neuroticism trait, a significant alcohol problem was present only in those with a high NU score [28]. NU seems to explain a part of the tendency to act carelessly in times of distress. Cougle and Timpano [29] demonstrated that this component

of impulsivity is associated with obsessive behaviors. On the other hand, the latter emphasizes that this association is present only in times of great distress. It also appears that situations characterized by negative affect may increase impulsive behavior in individuals with a predisposition toward NU [30]. For instance, during experimental induction of social rejection, participants demonstrated greater behavioral impulsivity during an inhibition task [30]. Those results demonstrate that negative affect can lead to increased behavioral disinhibition and therefore, increased impulsivity, especially in people with a high NU trait.

Since NU is linked to reckless acts when experiencing intense negative affect [24], unlike the facet of positive urgency which is its equivalent when experiencing intense positive affect, it is plausible to suggest that this facet of impulsivity could have an important role to play through various more problematic behaviors in society, such as aggressive behaviors. Several studies have attempted to clarify the link between NU and aggressive behaviors [7, 31–34]. Miller and Flory [32] demonstrated with the Conflict Tactics Scale that aggression was predicted by NU. In addition, the NU trait could increase the risk of aggression in two ways: 1) it could increase the reactivity to situations that incite aggression and 2) it could act as a disinhibitor, thus making the aggressive response more conducive and accessible [24, 33]. In another study by Maneiro and Cutrín [7], the authors tested the distinctiveness of proactive and reactive aggression. They demonstrated that NU, the impulsive/irresponsible factor of psychopathy, and the lack of agreeableness were associated with RA, while proactive aggression was rather associated with personality traits characterized by a lack of honesty/humility and emotionality. In parallel, in a meta-analysis aimed at observing the link between the different facets of impulsivity and aggression, it was shown by Bresin [33] that each facet of impulsivity correlated weakly or moderately with different forms of aggression, but that the correlation with NU was significantly stronger than with the other facets of impulsivity. Moreover, as predicted by the author, the negative/positive urgency facet was significantly related to the variance of RA, unlike the other facets of impulsivity, suggesting that individuals with high urgency traits may be more conducive to adopting aggressive behaviors after provocation. This assumption is consistent with the conceptualization of urgency as a reactive form of impulsivity [33]. The results of this study echo those of other studies, such as the one by Gagnon and Rochat [34], which demonstrated that NU could act as a mediator between hostile attribution bias (the fact to attribute hostile intentions to others in an ambiguous social situation) and RA. According to the authors, two routes could explain this relationship. On one hand, the tendency to use the hostile attribution bias accompanied by the accentuation of negative affect could facilitate RA through the difficulties of controlling and managing negative affect. On the other hand, hostile attribution biases emanating from social provocation could enhance RA through the triggering of inappropriate beliefs, which could thereby reduce the control of hostile thoughts and behaviors [34]. To a better understanding of the links between aggression and personality, Miller and Zeichner [31] simultaneously analyzed different personality and impulsivity models in relation to different forms of aggression (i.e., proactive, reactive, and relational). The analyses demonstrated from a trait perspective, that the three forms of aggression correlated significantly together and provided similar trait profiles. However, by only taking into account the residual results of RA (RA regressed on proactive aggression and relational aggression), the authors realized the existence of a correlation between RA and traits that are linked to negative emotions such as NU [31]. Moreover, in a study by Derefinko and DeWall [35], NU was a consistent predictor of intimate partner violence perpetration and plays a unique role

in the prediction of aggression toward an intimate partner, but not necessarily with a nonintimate partner; suggesting distinct cognitive processes between general violence and intimate violence behavior that need to be clarified. Thus, considering that a reactive-aggressive individual tends to overreact to a minor provocation and considering that, impulsivity is a tendency to act on the spur of the moment, unplanned and without thinking, the symbiotic relationship between RA and impulsivity, or the NU facet, is therefore evident.

Few studies have highlighted the relationship between image distorting style (or its defense mechanisms) and NU, or even with impulsivity in general. Indeed, in a study with a group of patients with depression, the authors report that splitting and projection were significantly correlated with impulsivity [36]. In a study with nonclinical participants, the results of Gagnon et al. [37] were able to confirm that splitting and identity diffusion reveal a unique association with impulsivity, although this association seems to vary depending on the tool used to assess impulsivity, according to the authors. Note that splitting has an influence on the proper development of ego functions such as impulse control [38].

It should also be noted that from a psychodynamic point of view, in particular from the classic model of "drive," the "Id" (concerned with the gratification of drives in pursuit of pleasure, Lehrman [39]), and the "superego" (concerned with the setting of limits or the permitting of liberties) have a primordial role in impulsiveness and in the complexity to be able to bear negative affects [38]. It is also important to emphasize that splitting has an influence on the normal development of ego functions (defensive part of the personality), for example, impulse control [38]. Moreover, despite the small number of studies that have investigated the relationship between image distorting style and NU, some studies raise indirect evidence indicating that these two variables are related. Indeed, it is plausible to propose that the "projection" defense mechanism resembles a dysfunctional belief such as hostile attribution bias. Based on this proposition, we could therefore expect the image distorting style to be associated with NU, given the results found in Gagnon and Rochat [34]. In the same vein, Gagnon et al. [40] proposed that dysfunctional social schemas (e.g., others are untrustworthy) that align with hostile attribution biases activate other schemas and cause the individual to feel compelled to perform an impulsive action in order to defend against the suffering resulting from an attack on his/her self-esteem.

Indeed, the image distorting style includes several defense mechanisms, some of which are related to the inhibition of dominant responses, for instance, *omnipotence* [19], a defense in which the subject reacts to emotional conflict or internal and external stressors by acting in a superior way to others as if this individual possesses special powers or abilities [15]. In parallel, NU was associated with inhibition of the dominant response [41]. Additionally, NU has been shown to mediate the association between hostile intent attribution biases (akin to projection) and impulsive behaviors (including aggression) [40]. Indeed, this relationship can be explained in terms of a belief that drives an individual to act impulsively. Thus, the relationship between image distorting style and NU remains to be clarified, namely whether it involves processes of inhibition on the dominant response or not. Does it increase affect beyond the ability to control action? Does it set up beliefs that encourage the person to become impulsive? In studies conducted with subjects diagnosed with borderline personality disorder, strong correlations have been found between image distorting style and various measures of impulsivity [42] and between primitive defense mechanisms (for example paranoid projection and splitting) and impulsivity [43]. In addition, one study demonstrated a relationship between borderline personality disorder

and the trait of urgency impulsivity [44]. In a prior study of a sample of different groups of obese women, researchers looked at differences in splitting, impulsivity, and difficulty in romantic relationships [45]. The group of obese women seeking bariatric treatment had significantly higher levels of splitting and impulsivity compared to the group of obese women who were not seeking this treatment, but lower levels compared to the obese group with bulimia nervosa (a disorder characterized by binge eating and consequent compensatory behaviors, excessive concerns about body shape and weight [46]) were obtained [45]. Furthermore, the results of Puhalla and McCloskey [47] demonstrated that participants with intermittent explosive disorder (a psychopathology known to exhibit impulsivity) had higher scores of immature defensive styles compared to a group of participants with personality disorders and a control group.

Overall, it appears clear that the relationship between image distorting defense mechanisms and impulsivity has generally been examined more in clinical than nonclinical participants. It is also obvious that there is a gap in the literature when it comes to explaining the complexity of the relationship between image distorting style and NU. Thus, it is of primary interest to perform analyses to examine the role of NU in the putative association that links image distorting style to RA.

Analyses that allow to understand the nature of the relationship between two variables are the moderation and mediation analysis. Moderation analyses aim to better understand if the strength or the sign of an effect of an independent variable on a dependent variable interacts with a moderator variable or variables [48]. Thus, moderation analyses describe when the variables are related to each other [49, 50] and also under what context or conditions relationships between variables occur [49]. A moderator can be defined as a qualitative or quantitative variable that influences the direction and/or the strength of the relationship between an independent or predictive variable and a dependent variable or a criterion [50]. When there are moderating effects, this indicates that the modeled function changes according to the different levels of the moderator, where the moderators can consist either of factors manipulated in an experimental context or of natural variables [51]. In the case of mediation analyses, these aim to understand the causal chains responsible for the effect of an independent variable on a dependent variable [48]. A mediator is defined as a variable that is located in a causal chain between two variables [51] and describes why and how the variables influence each other [49, 50].

From a theoretical point of view and according to the results of the studies found in the literature, it is logical to propose that NU could hold a role of moderator, and not of mediator in the relationship between image distorting style and RA. More specifically, it makes sense to postulate that the more an individual uses a defensive style that distorts the image of oneself or others, the more aggressively this individual will react to frustrating or provocative situations, and this relationship will be strengthened or weakened depending on whether the individual is considered capable of controlling their actions in an intense emotional context. The existing literature does not indicate if using image distorting style should lead them to become more impulsive and consequently react more aggressively in the presence of frustrating or provocative situations. This relationship remains unclear but is still possible. Thus, a moderation model can be proposed, in particular, that the link between the image distorting style and RA is moderated by the different levels of NU impulsivity trait. In the same vein, a second model of partial mediation (i.e., other mediating variables can explain the relationship between our independent and dependent variable) can

be proposed in order to demonstrate the absence of a mediating role of NU in the relationship between image distorting style and RA.

Overall, the previous data on defense mechanisms, impulsivity, and aggression raises several questions about the nature of the relationship between the distortion of the image of oneself or others and RA. For instance, what happens when an individual feeling negative emotion, with high or low levels of NU, uses defensive style that distorts the image of oneself or others? Does this individual react more aggressively to frustrating situations? Alas, there seems to be a gap in our understanding of the influence of NU in the relationship between distorting the image of self or others and reacting aggressively to frustrating or provocative situations. To our knowledge, no study to date has attempted to investigate the moderating role of NU on the relationship between image distorting style and RA or to refute its mediating role in this relationship.

The objective of the present study is to explain the nature of the relationship between image distorting style and reactive aggression, more specifically to demonstrate whether, in non-clinical participants, the relationship between image distorting defensive style and reactive aggression is moderated, not mediated by the negative urgency impulsivity trait. In agreement with the literature about the link between image distorting style and RA [19], we hypothesize that the relationship between image distorting style and RA will be moderated by NU, but will not be mediated by the latter. More specifically, we expect the relationship between these two variables of interest to be strengthened when the level of NU increases. A moderation model and a partial mediation model of NU will be tested between the image distorting style and RA.

2. Methodology

2.1 Participants

Our sample consisted of 32 participants (10 men and 22 women), (mean age = 30.0 years, SD = 9.0; mean education = 16.0 years, SD = 3.7) taken from a larger sample from a previous study [52], which included online questionnaires and experimental tasks in the laboratory. Participants were recruited from a university campus and the general population from advertisements placed in newspapers, on the internet, and in the local community. All participants underwent an initial screening telephone interview that included a brief description of the study, followed by a series of questions assessing sociodemographic information and study inclusion and exclusion criteria (see below). Potential participants were informed that the study consisted of two test sessions ranging from 60 to 90 minutes, or 3 hours in total. The inclusion criteria were to be between 18 and 55 years old, to be able to speak and read French, and to have normal or corrected vision. The exclusion criteria were to have a level of education lower than a sixth grade of primary school, to report having already had a head injury, and to have a history of psychosis. Prior to the lab visit, participants were required to complete the online questionnaires (DSQ-60, RPAQ, and UPPS; see below) that are part of this study. Thereafter, participants were invited to the lab to take part of another study and asked to abstain from alcohol and recreational drug use for at least 12 hours before each session. All participants gave written informed consent and obtained $40 (CAD) at the end of their participation.

2.2 Assessments and measures

2.2.1 Defensive style questionnaire (DSQ-60)

The DSQ-60 version is a self-reported questionnaire of 60 items which, based on the DSM-IV, makes it possible to measure the explicit derivatives of 30 defense mechanisms (i.e., two items per defense mechanism) [53]. Items are rated on a 9-point Likert-type scale ranging from 1 ("not at all applicable to me") to 9 ("completely applicable to me") and participants were asked how much each of the 60 items apply to them. This questionnaire makes it possible to evaluate three distinct defensive styles: "image distorting," "affect regulating," and "adaptive." The scores for each defensive style are estimated by taking the average of the two items corresponding to each defense mechanism and then adding it to the total mean score for each defensive style. The three defensive styles were determined through exploratory and confirmatory factor analyses by Thygesen and Drapeau [53] from a sample of anglophone and francophone university students. Internal consistency forthe defensive style "image distorting" was described as moderate (0.64) [54]. In the present study, we obtained an adequate internal coherence coefficient for image distorting style ($\alpha = 0.738$).

2.2.2 UPPS impulsivity behavior scale

The validated and translated version in French of the UPPS-P [55] was used to measure the negative urgency impulsivity trait. The UPPS-P is a 20-item self-report scale that assesses five aspects of impulsivity: positive urgency (e.g., "When overjoyed, I feel like I cannot stop myself from going overboard), negative urgency (e.g., When I feel rejected, I will often say things that I later regret), lack of perseverance (e.g., I am a person who always gets the job done), lack of premeditation (e.g., I usually make up my mind through careful reasoning), and sensation seeking (e.g., I welcome new and exciting experiences and sensations, even if they are a little frightening and unconventional). Items are rated on a 4-point scale ranging from 1 (= I agree strongly) to 4 (= I disagree strongly). Higher scores indicate higher level of impulsivity (note that all items of positive urgency, negative urgency and sensation seeking are reversed). The scores of that scale have good results in terms of internal consistency, test–retest stability, and predictive validity [55]. In the present study, the internal consistency for the subscale "negative urgency" demonstrate excellent reliability ($\alpha = 0.938$). Only the "negative urgency" subscale was used for the analyses in this study.

2.2.3 Reactive-proactive aggression questionnaire (RPAQ)

As part of this study, the RPAQ [5] translated into French and developed by Gagnon and Rochat [34] has been used. The RPQ contains 23 self-reported items rating reactions to aggressive situations on a 3-point Likert scale ranging from never to always (0–2). The Reactive Aggression Subscale (e.g., *"How often have you reacted angrily when provoked by others"*) contains 11 elements and the 12 proactive elements (e.g., "How often have you threatened and bullied someone"). Higher scores indicate a greater level of aggression. The reliability and validity of the scales have been demonstrated in samples of adolescents, undergraduates, and adults [5]. Only reactive aggression was considered for the purposes of our analyses in this study. In the present study, this subscale has a good reliability with a Cronbach's α of 0.077.

2.3 Statistical analysis

All statistical analyses were performed with Rstudio team (2021). First, we took care to perform preliminary analyses to verify certain factors and ensure that the assumptions of multivariate normality were respected. Second, descriptive analyses were carried out in order to obtain a detailed overview of our sample at the level of gender, age, and education. Third, a moderation analysis was performed to test the hypothesis that the impulsivity trait NU moderates the association between image distorting style and RA. Fourth, a partial mediation analysis was performed to test the hypothesis that the association between image distorting style and RA is not mediated by NU. The direct and indirect link between image distorting and RA have therefore been modeled. A coefficient product test for mediation analyses was performed using bootstrapping procedures, a robust nonparametric resampling technique for testing indirect effects [56, 57]. It is recommended to use this resampling technique instead of the widely used Sobel test with the recommended option of Baron and Kenny [50], which is a standard hypothesis test [58]. Bootstrapping allows us to give less weight to scores that are rarer in our sample in order to ensure that our probabilities are not too affected by sampling errors. A mediating effect is assumed when the bias-corrected 95% confidence intervals (CIs) do not contain the value zero [48]. Estimates were based on 5000 bias-corrected bootstrap samples.

3. Results

3.1 Preliminary analysis

The presence of important independent variables, sample size, missing data, range, extreme scores, independence of scores, normality of variables, linearity, multicollinearity, normality of residuals, and homogeneity of the variance of the residuals (homoscedasticity) was examined. Multivariate extreme scores were checked by examining the Mahalanobis distance. All of these factors and assumptions were respected.

3.2 Moderation analysis

To avoid potential multicollinearity issues, all continuous independent variables were centered. Next, we multiplied together the independent variable image distorting style with the moderator NU to create the interaction term. Model 1, without the interaction term, was significant $F(2, 29) = 28.961$, $p < 0.001$. Model 2, with the interaction term, was also significant $F(3, 28) = 18.750$, $p < 0.001$. However, model 2 with the interaction term between image distorting style and NU did not account for significantly more variance than model 1. The R squared of our interaction term was found to be insignificant $\Delta R2 = 0.001$, $p = 0.744$, indicating that there is no interaction. These results do not support the hypothesis that the association between image distorting style and RA is potentially moderated by the different levels of NU.

3.3 Partial mediation analysis

A proposed partial mediation model was tested to verify the hypothesis that the association between image distorting style and RA is not mediated by NU. The determinant

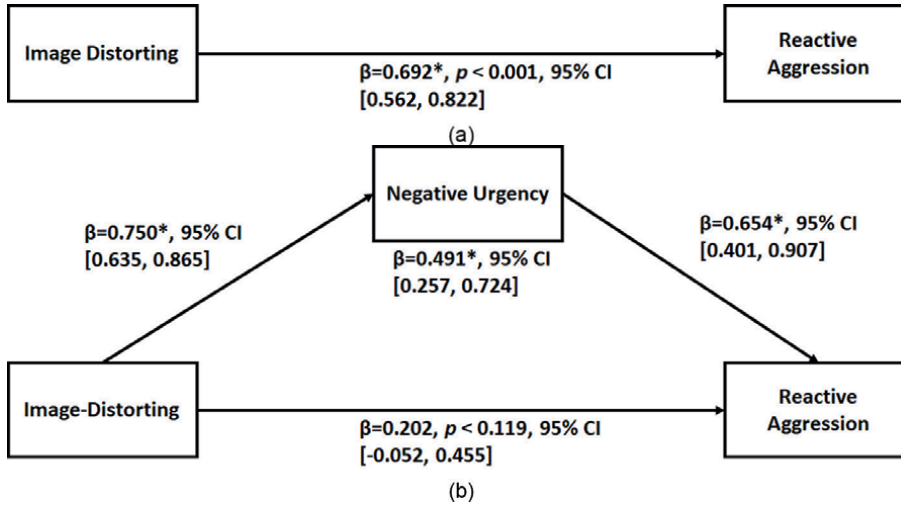


Figure 1.
a. Total effect of the image distorting-reactive aggression relationship. The beta shown in this figure is standardized. b. Mediation of the image distorting-reactive aggression relationship through negative urgency. The betas shown in this figure are all standardized.

of the correlation matrix is 0.145, which is greater than 0.0001 and suggests an absence of multicollinearity. Looking at the model (see **Figure 1a**), the results indicated that the total effect was significant (β = 0.692, p < 0.001, (95% CI [0.562, 0.822])). By observing the model with the inclusion of the NU variable as a mediating variable (see **Figure 1b**), the results demonstrated that the direct link between image distorting style and RA turned out to be nonsignificant (β = 0.202, p = 0.119, (95% CI [−0.052, 0.455])). The results also indicated a significant direct relationship between image distorting style and NU (β = 0.750, p < 0.001, (95%CI [0.635, 0.865]). In addition, a direct link between NU and RA was found (β =0.654, p = p < 0.001, (95% CI [0.401,0.907]). The results indicated a significant indirect relationship between image distorting style and RA via NU (β = 0.491 (95% CI [0.257, 0.724]), p = 0.001. The results suggest that NU fully mediates the association between image distorting style and RA.

An effect size of 0.563 was obtained for NU and 0.666 for RA, which is considered large effects according to [59]. This indicated that 56.3% of the average NU variance is explained by the variables in our model, while 66.6% of the variance in RA is explained by other variables in our model.

We tested the proposed partial mediation model by adding the variables age and education as covariates. None of our covariates was found to be significantly related to RA. The results obtained by performing a mediation test with the addition of one of the covariates are not essentially different from those obtained without the addition of the covariates.

4. Discussion

The objective of this study was to explain the nature of the relationship between image distorting style and reactive aggression, more specifically to demonstrate whether, in nonclinical participants, the relationship between image distorting defensive style and reactive aggression is moderated, not mediated by the negative

urgency impulsivity trait. Contrary to the hypothesis that was proposed, the results of the moderation analysis were not able to demonstrate that NU acts as a moderator in the relationship between image distorting style and RA.

Results obtained from the proposed partial mediation model are the significant indirect link and the non-significant direct link between image distorting style and RA (see **Figure 1b**), even after controlling for age and number of years of education. This suggests that NU mediates not partially but fully the relationship between image distorting style and RA. Thus, the more a person distorts the image of oneself or others, the more he/she acts impulsively with NU, and the more he/she will react aggressively in response to provocations or frustration. This is in accordance with the results of Gagnon and Rochat [34], demonstrating a similar mediation role with hostile attribution biases, instead of image distorting style. This makes sense when considering HAB as a distortion of reality, since it arises from a person's subjective interpretation of it, based on a given context and can be a distorted, or misinterpreted reflection of reality. In Gagnon et al. [19], a significant correlation has been found between the event-related N400 in a nonhostile condition and image distorting style, namely between hostile intent attribution and image distorting style. It is plausible that hostile intent attribution/hostile attribution biases are conceptually closely related to image distorting style, given the projective components of hostility. Consequently, it is possible to believe that the mediation role of NU obtained in the actual paper is an extension of the one found between hostile attribution biases and RA. The direct link between image distorting and NU was found significant, which suggests that the more an individual makes use of a defense mechanism distorting the image of oneself or others, the more this individual will have a disposition to have reckless behaviors during negative affective state, which is consistent with studies that have found indirect results on this relationship [19, 40, 41]. The direct link between NU and RA was found to be significant, supporting findings found in the literature, suggesting that the more individuals have a disposition to initiate reckless behaviors when resenting negative affective state, the more aggressively they will react to provocation [7, 31–34].

The total effect was found to be significant, suggesting that image distorting has a positive influence on RA when not controlling for the relationship between the mediator NU and RA, which is in agreement with the results of Gagnon et al. [19]. A surprising result is the complete mediating role of NU in the relationship between image distorting style and RA (given the lack of knowledge in the literature on the mediating role of NU in this relationship). We believe that other variables may have a role in the proposed causal chain, for instance, other types of impulsivity such as state impulsivity [60]. Taken together, our results suggest that when individuals put themselves in a defensive state leading to distorted images of self and others, they become more emotionally impulsive, leading to RA. In other words, the use of defense mechanisms associated with image distorting style could be the starting point in triggering RA when NU mediates this relationship. Without NU, the individual could simply distort their reality, but when NU is involved, RA is more likely to translate at the behavioral level. This is plausible on a theoretical level, given the significant mediator effect of NU in the relationship between image distorting style and RA is conceptually close to the one found between hostile attribution biases and RA [34], hostile attribution biases being conceived, such as a kind of projection defense mechanism or a defense distorting the image of others. Globally, two paths may elucidate the relationship between image distorting style and NU in the endorsement of RA behaviors. The first possible path might be that the tendency to make use of image distorting style increases negative effect, which in turn increases the difficulty to

control negative effect, and ultimately facilitates RA behaviors. A second path might be that image distorting style may activates dysfunctional beliefs (e.g., categorizing someone as bad), which may reduce the capacity of an individual to control his/her perception of other individuals, then facilitating the enactment of RA behaviors via an oversimplified and subjective perception [40].

Our study has several limitations that should be taken into consideration. It is paramount to consider that longitudinal designs are greatly preferable for testing if an effect is stable across time and if there is a proof of temporal precedence [51]. The actual study used a cross-sectional design, so we must therefore interpret our results with caution because the cross-sectional design does not allow us to really evaluate the proposed causal chain. Thus, we recommend for future studies to develop a protocol with a longitudinal design. Another limitation to consider is the small sample of the actual study, which might have restrained sufficient statistical power for examining particular hypotheses. The data used for our analyses are secondary, so it is not possible to make causal inferences from our obtained statistical results. We, therefore, recommend setting up a protocol with the specific aim of verifying the hypotheses proposed in this study. We also recommend using tools other than self-report questionnaires, as participants may demonstrate social desirability when completing this questionnaire or may simply be unaware of the defense mechanisms they are using. Qualitative interviews and projective tests would make it possible to evaluate the use of defense mechanisms of image distorting style of the participant from another perspective (for instance the Thematic Apperception Test or the Rorschach Inkblot Test).

5. Conclusion

The present study investigated the role of NU in the relationship between image distorting style and RA. Taken together, the results obtained in this preliminary study suggest that NU plays a crucial role in the relationship between image distorting style and RA and possesses important theoretical and clinical implications for enabling clinicians to better intervene at the source of aggressive behaviors, which according to our results, could be found as much in dysfunctional beliefs or the use of defense mechanisms with the function of distorting reality (the use of image distorting defense mechanisms being known to harm the therapeutic alliance [61]) as in certain facets of impulsivity such as NU. Our results may provide a better explanation of the internal factors that could increase RA and an opportunity to prevent aggressive behaviors based on this finding. Thus, the results of the present study make it possible to better understand the complexity of the link, which unites the image distorting style and RA.

Acknowledgements

This study was supported by a research grant to JG and Pierre Jolicoeur (PJ) from the Social Sciences and Humanities Research Council of Canada SSHRC (no. 430-2014-00729), the Canada Foundation for Innovation (201412), and the Canada Research Chairs (950-212663) program awards to PJ.

Notes/thanks/other declarations

JG conceptualized the study and provided the data. PM, DR, and JG analyzed and interpreted the data and contributed to the writing of the manuscript. All authors have approved the submitted version of this manuscript.

Author details

Paul McNicoll*, David Richard and Jean Gagnon
University of Montreal, Montreal, Canada

*Address all correspondence to: paul.mc.nicoll@umontreal.ca

References

[1] Crick NR, Dodge KA. Social information-processing mechanisms in reactive and proactive aggression. Child Development. 1996;**67**(3):993-1002

[2] Blair RJR. Traits of empathy and anger: Implications for psychopathy and other disorders associated with aggression. Philosophical Transactions of the Royal Society B: Biological Sciences. 2018;**373**(1744):20170155

[3] Berkowitz L. Aggression: Its causes, consequences, and control. New York, NY, England: Mcgraw-Hill Book Company; 1993. p. xxiv, 485-xxiv

[4] Wilkowski BM, Robinson MD. The anatomy of anger: An integrative cognitive model of trait anger and reactive aggression. Journal of Personality. 2010;**78**(1):9-38

[5] Raine A, Dodge K, Loeber R, Gatzke-Kopp L, Lynam D, Reynolds C, et al. The reactive-proactive aggression questionnaire: Differential correlates of reactive and proactive aggression in adolescent boys. Aggressive Behavior. 2006;**32**(2):159-171

[6] Vitaro F, Brendgen M, Barker ED. Subtypes of aggressive behaviors: A developmental perspective. International Journal of Behavioral Development. 2006;**30**(1):12-19

[7] Maneiro L, Cutrín O, Gómez-Fraguela XA. Gender differences in the personality correlates of reactive and proactive aggression in a Spanish sample of young adults. Journal of Interpersonal Violence. 2022;**37**(7-8):NP4082-NNP107

[8] Sun L, Li J, Niu G, Zhang L, Chang H. Reactive aggression affects response inhibition to angry expressions in adolescents: An event-related potential study using the emotional go/No-go paradigm. Frontiers in Psychology. 2020;**11**:558461

[9] Zhang Z, Wang Q, Liu X, Song P, Yang B. Differences in inhibitory control between impulsive and premeditated aggression in juvenile inmates. Frontiers in Human Neuroscience. 2017;**11**:373

[10] Hecht LK, Latzman RD. Exploring the differential associations between components of executive functioning and reactive and proactive aggression. Journal of Clinical and Experimental Neuropsychology. 2018;**40**(1):62-74

[11] Farah T, Ling S, Raine A, Yang Y, Schug R. Alexithymia and reactive aggression: The role of the amygdala. Psychiatry Research: Neuroimaging. 2018;**281**:86-89

[12] Hamann SB, Ely TD, Hoffman JM, Kilts CD. Ecstasy and agony: Activation of the human amygdala in positive and negative emotion. Psychological Science. 2002;**13**(2):135-141

[13] Mincic AM. Neuroanatomical correlates of negative emotionality-related traits: A systematic review and meta-analysis. Neuropsychologia. 2015;**77**:97-118

[14] Vaillant GE. Ego Mechanisms of Defense: A Guide for Clinicians and Researchers. Vol. xiv. Arlington, VA, US: American Psychiatric Association; 1992. pp. 306-xiv

[15] Di Giuseppe M, Perry JC. The hierarchy of Defense mechanisms: Assessing defensive functioning with the Defense mechanisms rating scales Q-Sort. Frontiers in Psychology. 2021;**12**:718440

[16] Perry JC. Anomalies and specific functions in the clinical identification of Defense mechanisms. Journal of Clinical Psychology. 2014;**70**(5):406-418

[17] Waska RT. Projective identification, countertransference, and the struggle for understanding over acting out. The Journal of Psychotherapy Practice and Research. 1999;**8**(2):155-161

[18] Hovanesian S, Isakov I, Cervellione KL. Defense mechanisms and suicide risk in major depression. Archives of Suicide Research. 2009;**13**(1):74-86

[19] Gagnon J, Quansah JE, McNicoll P. Cognitive control processes and Defense mechanisms that influence aggressive reactions: Toward an integration of socio-cognitive and psychodynamic models of aggression. Frontiers in Human Neuroscience. 2022;**15**:14-19

[20] Lee YJ, Keum MS, Kim HG, Cheon EJ, Cho YC, Koo BH. Defense mechanisms and psychological characteristics according to suicide attempts in patients with borderline personality disorder. Psychiatry Investigation. 2020;**17**(8):840-849

[21] Zanarini MC, Weingeroff JL, Frankenburg FR. Defense mechanisms associated with borderline personality disorder. Journal of Personality Disorders. 2009;**23**(2):113-121

[22] Moeller FG, Barratt ES, Dougherty DM, Schmitz JM, Swann AC. Psychiatric aspects of impulsivity. American Journal of Psychiatry. 2001;**158**(11):1783-1793

[23] Whiteside SP, Lynam DR. The five factor model and impulsivity: Using a structural model of personality to understand impulsivity. Personality and Individual Differences. 2001;**30**(4):669-689

[24] Cyders MA, Smith GT. Emotion-based dispositions to rash action: Positive and negative urgency. Psychological Bulletin. 2008;**134**(6):807-828

[25] Verdejo-Garcia A, Bechara A, Recknor EC, Perez-Garcia M. Negative emotion-driven impulsivity predicts substance dependence problems. Drug and Alcohol Dependence. 2007;**91**(2-3):213-219

[26] Karyadi KA, King KM. Urgency and negative emotions: Evidence for moderation on negative alcohol consequences. Personality and Individual Differences. 2011;**51**(5):635-640

[27] Simons JS, Dvorak RD, Batien BD, Wray TB. Event-level associations between affect, alcohol intoxication, and acute dependence symptoms: Effects of urgency, self-control, and drinking experience. Addictive Behaviors. 2010;**35**(12):1045-1053

[28] Fisher LB, Miles IW, Austin SB, Camargo CA, Colditz GA. Predictors of initiation of alcohol use among US adolescents. Archives of Pediatrics & Adolescent Medicine. 2007;**161**(10):959

[29] Cougle JR, Timpano KR, Goetz AR. Exploring the unique and interactive roles of distress tolerance and negative urgency in obsessions. Personality and Individual Differences. 2012;**52**(4):515-520

[30] Chester DS, Lynam DR, Milich R, DeWall CN. Social rejection magnifies impulsive behavior among individuals with greater negative urgency: An experimental test of urgency theory. Journal of Experimental Psychology. General. 2017;**146**(7):962-967

[31] Miller JD, Zeichner A, Wilson LF. Personality correlates of aggression: Evidence from measures of the

five-factor model, UPPS model of impulsivity, and BIS/BAS. Journal of Interpersonal Violence. 2012;**27**(14):2903-2919

[32] Miller J, Flory K, Lynam D, Leukefeld C. A test of the four-factor model of impulsivity-related traits. Personality and Individual Differences. 2003;**34**(8):1403-1418

[33] Bresin K. Impulsivity and aggression: A meta-analysis using the UPPS model of impulsivity. Aggression and Violent Behavior. 2019;**48**:124-140

[34] Gagnon J, Rochat L. Relationships between hostile attribution Bias, negative urgency, and reactive aggression. Journal of Individual Differences. 2017;**38**(4):211-219

[35] Derefinko K, DeWall CN, Metze AV, Walsh EC, Lynam DR. Do different facets of impulsivity predict different types of aggression? Aggressive Behavior. 2011;**37**(3):223-233

[36] Corruble E, Bronnec M, Falissard B, Hardy P. Defense styles in depressed suicide attempters. Psychiatry and Clinical Neurosciences. 2004;**58**(3):285-288

[37] Gagnon J, Vintiloiu A, McDuff P. Do splitting and identity diffusion have respective contributions to borderline impulsive behaviors? Input from Kernberg's model of personality. Psychoanalytic Psychology. 2016;**33**(3):420-436

[38] Gagnon J, Daelman S. An empirical study of the psychodynamics of borderline impulsivity: A preliminary report. Psychoanalytic Psychology. 2011;**28**(3):341-362

[39] Lehrman SR. Ego, superego and id-or life, liberty and the pursuit of happiness. The Psychiatric Quarterly. 1968;**42**(2):381-390

[40] Gagnon J, McDuff P, Daelman S, Fournier S. Is hostile attributional bias associated with negative urgency and impulsive behaviors? A social-cognitive conceptualization of impulsivity. Personality and Individual Differences. 2015;**72**:18-23

[41] Cyders MA, Coskunpinar A. Depression, impulsivity and health-related disability: A moderated mediation analysis. Journal of Research in Personality. 2011;**45**(6):679-682

[42] van Reekum R, Links PS, Mitton MJE, Fedorov C, et al. Impulsivity, defensive functioning, and borderline personality disorder. The Canadian Journal of Psychiatry/ La Revue canadienne de psychiatrie. 1996;**41**(2):81-84

[43] Chabrol H, Leichsenring F. Borderline personality organization and psychopathic traits in nonclinical adolescents: Relationships of identity diffusion, primitive defense mechanisms and reality testing with callousness and impulsivity traits. Bulletin of the Menninger Clinic. 2006;**70**(2):160-170

[44] Whiteside SPH, Lynam DR, Miller JD, Reynolds SK. Validation of the UPPS impulsive behaviour scale: A four-factor model of impulsivity. European Journal of Personality. 2005;**19**:559-574

[45] Zmolikova J, Pichlerova D, Bob P, Schückova D, Herlesova J, Weiss P. Splitting, impulsivity, and intimate partnerships in young obese women seeking bariatric treatment. Neuropsychiatric Disease and Treatment. 2016;**12**:2-3

[46] Lavender JM, Wonderlich SA, Engel SG, Gordon KH, Kaye WH,

Mitchell JE. Dimensions of emotion dysregulation in anorexia nervosa and bulimia nervosa: A conceptual review of the empirical literature. Clinical Psychology Review. 2015;**40**:111-122

[47] Puhalla A, McCloskey M, Brickman LJ, Fauber RL, Coccaro EF. Defense styles in intermittent explosive disorder. Psychiatry Research. 2016;**238**:137-142

[48] Hayes AF. Introduction to meditation, moderation, and conditional process analysis: A regression-based approach. 3rd ed. New York: The Guilford Press; 2020

[49] Igartua JJ, Hayes AF. Mediation, moderation, and conditional Process analysis: Concepts, computations, and some common confusions. The Spanish Journal of Psychology. 2021;**24**:2-7

[50] Baron RM, Kenny DA. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. Journal of Personality and Social Psychology. 1986;**51**(6):1173-1182

[51] Mackinnon DP, Fairchild AJ, Fritz MS. Mediation analysis. Annual Review of Psychology. 2007;**58**(1):593-614

[52] Gagnon J, Jolicœur P. Mécanismes cognitifs et neurophysiologiques associés au trait "Urgence" de la personnalité: intégration théorique et empirique. Insight Development: Social Sciences and Humanities Research Council of Canada; 2014

[53] Thygesen KL, Drapeau M, Trijsburg RW, Lecours S, De Roten Y. Assessing defense styles: Factor structure and psychometric properties of the new Defense style questionnaire 60 (DSQ-60). International Journal of Psychology and Psychological Therapy. 2008;**8**(2):171-181

[54] Petraglia J, Thygesen KL, Lecours S, Drapeau M. Gender differences in self-reported defense mechanisms: A study using the new Defense style Questionnaire-60. American Journal of Psychotherapy. 2009;**63**(1):87-99

[55] Billieux J, Rochat L, Ceschi G, Carré A, Offerlin-Meyer I, Defeldre A-C, et al. Validation of a short French version of the UPPS-P impulsive behavior scale. Comprehensive Psychiatry. 2012;**53**(5):609-615

[56] Preacher KJ, Hayes AF. SPSS and SAS procedures for estimating indirect effects in simple mediation models. Behavior Research Methods, Instruments & Computers. 2004;**36**(4):717-731

[57] Preacher KJ, Hayes AF. Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. Behavior Research Methods. 2008;**40**(3):879-891

[58] Fritz MS, Mackinnon DP. Required sample size to detect the mediated effect. Psychological Science. 2007;**18**(3):233-239

[59] Cohen J. Statistical power analysis for the. Behavioral Sciences. 2013. p. 30

[60] Halvorson MA, Pedersen SL, Feil MC, Lengua LJ, Molina BSG, King KM. Impulsive states and impulsive traits: A study of the multilevel structure and validity of a multifaceted measure of impulsive states. Assessment. 2021;**28**(3):796-812

[61] Bond M. Empirical studies of Defense style: Relationships with psychopathology and change. Harvard Review of Psychiatry. 2004;**12**(5):263-278

Chapter 8

Comprehensive Assistance System for Victims of Gender-Based Violence

Miguel Á. Domínguez, Raquel Pérez-Aloe, Bruno Pérez, Javier Lozano and Juan M. Carrillo

Abstract

The system presented in this work is intended to be used by women who live with the domestic aggressor and therefore do not have a restraining order or judicial mechanisms that can protect them. It is based on the use of small wireless electronic devices, using a Bluetooth connection to send a message to a smartphone. One of the main features of the device is that it can be hidden in different accessories of the victims, such as brooches, necklaces, watches, bracelets, and belts. In this way, it can be customized according to the victim's personal preferences so that it can go completely unnoticed by the perpetrator. Besides, an application developed in Android and iOS is responsible for transmitting the alarm message to a central server, along with the *GPS* geolocation and the victim's identifier. A web service is run on the server that manages the entire alert system and, if necessary, notifies the police or protection services of this emergency. Several designs of electronic devices with panic button have been developed, along with the applications for the mobile phone and the programming of the web server.

Keywords: gender-based violence victims, assistance system, camouflaged electronic device, mobile apps, web service, control center

1. Introduction

In a society that is increasingly connected by new technologies at the service of communications, commerce, transport, entertainment, industry, or even things (*Internet of Things, IoT*), paradoxically, there is a serious problem of social isolation. Indeed, women who suffer harassment, aggression, and injuries that even eventually lead to death, often hide these circumstances, avoiding requesting the necessary help that would alleviate this serious situation of vulnerability and loneliness. Violence against women, especially intimate partner violence, is a human rights violation and one of the most serious public health problems. According to research by the United Nations Office on Drugs and Crime, released on the International Day for the Elimination of Violence against Women, a total of 87,000 women were intentionally murdered in 2017. Around a third (30,000) were killed by their present or former

partner [1]. Recent research published in the journal Lancet has further revealed that more than one in four women in the world is estimated to have experienced gender-based violence by a partner or ex-partner in her lifetime. These new estimations indicate that, prior to the COVID-19 pandemic, 27% of women aged 15–49 who had ever been in a relationship, had suffered physical and/or sexual intimate partner violence in their lifetime, and one in seven (13%) had experienced recent intimate partner violence [2]. All these data show that violence against women is unfortunately an extremely common practice. So much so that the United Nations (UN) even referred to it in 2013 as "a global health problem of epidemic proportions". Intimate partner violence can have major short-term and long-term physical and mental health effects, including injuries, depression, anxiety, unwanted pregnancies and abortions, and sexually transmitted infections among others, and can also lead to death [3].

Most international organizations have developed mechanisms to tackle the eradication of violence against women. It is worth mentioning the UN's contribution, within the framework of the Universal Declaration of Human Rights of December 10, 1948, which enshrines the right to equality, as well as to the achievement of fundamental rights and freedoms without any discrimination because of gender [4–9].

Similarly, within the Council of Europe, numerous approaches have been taken to deal with all forms of violence against women [10–13]. Spain, for example, had already focused its attention on this problem since the 1980s. At present, Spain has a wide range of regulations that provide, from a comprehensive point of view, for the prosecution and elimination of any form of violence against women, from a criminal, procedural, welfare, police, civil, administrative, educational, labor, health, and other approaches, with the aim of protecting and supporting women who have suffered violence in their recuperation. Also, these regulations promote the necessary changes in society to prevent it, reject it, and place it beyond the private sphere, making it a social problem [14–17].

Since its implementation, many countries around the world have been interested in this system and have been inspired by it to develop similar legislation in their respective legal systems. In 2014, institutions such as the UN, the World Future Council, and the Inter-Parliamentary Union acknowledged Spain's Organic Law 1/2004 as one of the most effective regulations in the world for combating gender-based violence.

Despite the different legislations, plans, and strategies approved for the eradication of violence against women, from 1 January 2003 to this day, 17 January 2023, 1186 women have been murdered by their partners or ex-partners. The annual reports issued by the Observatory against Domestic and Gender Violence highlight the need to keep on acting, through the coordination of police agents and the personalization of victim assistance. The Delegation of the Government for Gender Violence has been carrying out statistics since 2003, which provide information on women killed by gender violence. Within these victims, there were those who had previously denounced their aggressor and those who had not, victims who lived with their aggressor, etc. The collected data provide a profoundly social vision that endorses the necessity for everyone to become aware of the problem to try to eradicate it.

In relation to the complaints made, around 75% of the victims had not filed a complaint against their aggressor and 64.9% were still living with him at the time of the death. Regarding the resources used to provide an effective response to this problem, it is worth mentioning the "Protocol of Actions for the Monitoring by Telematic Means of the restraining orders prohibiting approximation to the Gender Violence Victim" [18]. The remote monitoring system makes it possible to supervise

compliance with precautionary measures and restraining orders prohibiting approximation to the victim imposed by procedures against gender violence in cases where the courts approve their use for this purpose. Their main purpose, therefore, is to increase the safety and protection of victims. It provides permanently updated information about issues that affect compliance or noncompliance of precautionary measures or sentences, or any possible incidents, whether accidental or deliberate, in the operation of the equipment used.

The monitoring system consists of two essential elements: the devices for the victim and the perpetrator and the control center that is responsible for installation, maintenance, and removal of the devices, as well as handling any events they indicate (alarms, alerts, etc.). The electronic devices that are part of the monitoring system, as shown in **Figure 1**, are the following:

1. Devices for the perpetrator:

    - The radio frequency (*RF*) transmitter, displayed in (**Figure 1a**), is a small, lightweight bracelet that emits a *RF* signal that is received by a second unit and incorporates sensors to detect tampering or breakage, as well as the absence of physical contact with the wearer.

    - The *2Track* unit is a Global Position System (*GPS*) tracking device that incorporates the basic functionalities of a mobile phone in addition to the reception of the *RF* signal emitted by the *RF* transmitter. It can be seen in (**Figure 1b**).

2. Device for the victim, shown in **Figure 1c**, is practically identical to the *2Track* unit carried by the convicted person. It incorporates an external *RF* antenna that allows to detect the *RF* signal from the transmitter.

The alerts can be generated for the following causes: entrance into an exclusion zone, detection of the *RF* signal by the victim's *2Track* unit, low battery, breaking or distancing of the *2Track*-bracelet unit, panic button press, and entrance into a proximity zone.

When an alarm occurs, the control center carries out the communications established in the Protocol of Actions for each type of alarm and prepares a report that will be sent to the police unit responsible for the protection of the victim, the judicial

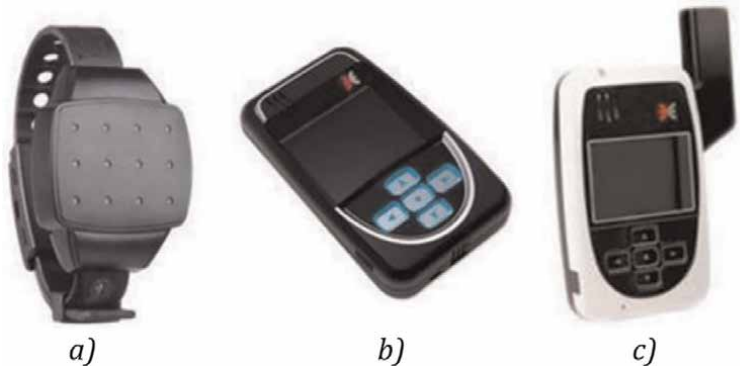


Figure 1.
Telematics system devices: for the perpretator a) and b), c) is the device for women.

authority, and the public prosecutor's office. It should be noted that when the panic button is pressed by the victim, the control center contacts her to verify whether it is an accidental call or whether it is due to a situation of danger. If communication is not achieved or if a situation of danger is confirmed, the control center communicates the incident to the police forces, maintaining permanent communication with them to facilitate the location of the victim, and activating immediately the police protection operative.

Other resources 24-7-365 accessible to victims are the 016 service, which offers information and legal advice on issues of gender-based violence, and *ATENPRO*, which provides the victims immediate remote assistance by a mobile terminal that enables them to be in permanent contact with a support center that responds quickly to cope with any situation that may arise.

Although, as we have just seen, there are multiple mechanisms currently available to victims of gender-based violence to protect themselves and ask for help, the fact is that the number of fatal victims is not decreasing and remains very high. It is worth noting that in 2021, 48 women were murdered in Spain, of whom approximately 57.4% lived with the perpetrator and 80.9% had never filed a complaint against their aggressor. Therefore, the current concept of monitoring of the aggressor is insufficient for the real prevention of this kind of violence.

2. Proposed system

In an attempt to provide a possible solution to the above-mentioned problem, one of the nonprofit associations committed to eradicating gender-based violence, *Asociación ALMA Contra la Violencia de Género (ALMA Association Against Gender Violence)*, carried out a study to detect possible weaknesses in the resources provided to a woman by the government [19]. The methodology followed in this study was, first, to interview women victims of gender-based violence who had filed a legal complaint, some of whom had a monitoring system, to find out what should be the most appropriate characteristics that the alarm devices ought to have. The study also focused on the fact that the number of complaints dismissed for lack of evidence is approximately 50% [20]. The two main characteristics highlighted by the victims were that the device could be easily concealed in some of the victim's accessories so that it could remain unnoticed by the aggressor and that the threats could be recorded to be used later as possible legal evidence. The next step was to examine existing alarm devices on the market, as well as those available through the legal system to determine whether they fulfilled the specifications demanded by the women. Regarding existing pocket alarms on the market, such as *flic* [21], *HelpySafe* [22], *Minew SOS emergency button* [23], or panic button bracelets such as *Kwema* [24] or *Safelet* [25], none of them met the requested requirements. These commercial devices are not miniaturized and therefore cannot be adapted and camouflaged in the victim's accessories to pass undetected by the aggressor.

Concerning the resources available under the laws, some features should be included so that they could meet the specifications most requested by the victims. Thus, it was concluded that it would be necessary to develop a new device that would widen the present coverage that is, currently provided to potential victims. For example, to use this new device, it would not be necessary to cohabit with the aggressor or to have filed a previous complaint. **Figure 2** shows a comparison of the characteristics of the main governmental resources available to victims of

Figure 2.
Comparative characteristics of different systems for the prevention of gender-based violence.

gender-based violence and the proposed new system. To implement this new system, *ALMA Association* contacted the Electronic Technology Group of the Department of Electrical, Electronic, and Automatic Engineering of the University of Extremadura. As a result of this collaboration, a *comprehensive assistance system for victims of gender violence* has been proposed.

The objectives to be achieved by the system to be developed were defined around six fundamental points to meet the required features:

1. **Miniaturization** of the electronic device, which will allow for a versatile form of it, facilitating its use in different circumstances, characteristics, or personal limitations.

2. Possibility for the electronic device to be **camouflaged** in the victim's accessories such as watches, bracelets, and belts. This will allow the device to be hidden from the aggressor and thus, being unaware of its physical morphology, which will prevent it from being located and neutralized.

3. Following the recommendations of the bodies involved in the eradication of gender violence, a mechanism for **collecting audio**, that can be used as legal evidence, is incorporated. In this way, the large number of complaints of mistreatment that are not admitted for lack of evidence is avoided.

4. **Low power consumption**, allowing a long battery life.

5. Development of **applications for mobile phones** that register the sound of the victim's environment and send the alarm signal and the location of the victim to a control center.

6. Creation of a **control center** for the monitoring and tracking of victims, which would be also responsible for coordinating the actions established in the protocols of action referred to police forces.

Figure 3 illustrates the block diagram of the proposed system that fulfills the objectives described above. As can be seen, it consists of three elements: one of them is called the camouflaged alarm device, which would be concealed in some of the victim's accessories in order to hide its true function, other components would be a smartphone, in the case that the victim had access to it, or another concealed device (modem) that would allow connection and sending of information to the third element, which is a control center in charge of monitoring victims. In this way, if the victim did not have a mobile phone (which is very common in this context), another camouflaged device could be provided to carry out the mission of launching the emergency call.

Therefore, the main functions of the proposed system are:

1. **Activate the assistance warning**: once the device receives the alert signal, it sends a message to the control center or official body, which is responsible for activating the assistance protocol and alerting at least one person in the victim's environment.

2. **Locate the emergency call** *via GPS* or connection antennas.

3. **Make an audio recording** of the threats.

The proposed procedure is as follows: once the victim detects a possible situation of violence, she activates the panic button so that the alert protocol is initiated. This consists of activating the microphone installed in the camouflaged device to register the aggressor's threats, thus facilitating the processing of a possible complaint by having evidence, if any, of verbal aggression. The audio signal is sent to the mobile phone where it is recorded. In addition, the mobile phone sends a message requesting help to the control center with the coordinates of the victim's location. The control center will act according to the protocol foreseen for this type of situation, also notifying the police forces and a "lifesaver" from the victim's environment. It should

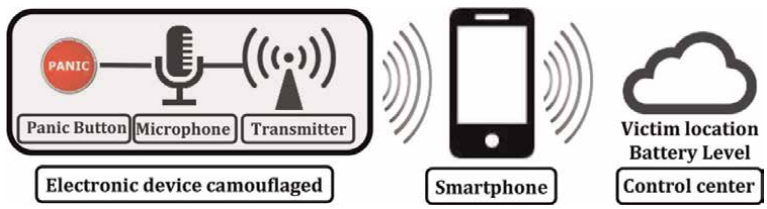


Figure 3.
Block diagram of the proposed alarm system.

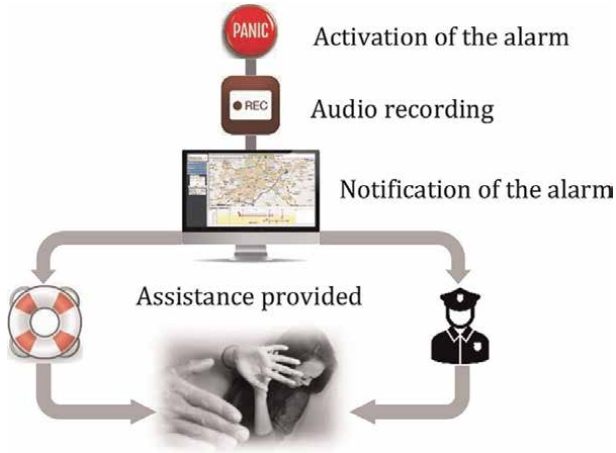


Figure 4.
Protocol of action for the incorporation of the alarm device into the comprehensive assistance system.

be noted that both will have the *GPS* location of the victim so that they will be able, if necessary, to go to the victim's position. The protocol of actions that are initiated once the panic button is activated is illustrated in **Figure 4**.

3. Implemented system

3.1 Electronic device

As mentioned above, two of the objectives proposed in the design and development of the device were the low power consumption and miniaturization. To achieve these objectives, *Bluetooth low energy (BLE)* technology was chosen, due to its widespread availability on the market, the easy connectivity to a mobile phone, its reduced dimensions, and low power consumption. The core component of the electronic device is the nRF51822 *System on Chip (SoC)*, from Nordic Semiconductor's nRF51 series [26]. The devices of the nRF51 family have a wide supply voltage range (1.8 V–3.6 V) and can be programmed in different ways from C code to Python, Mbed system, or Arduino kernel. In this design, it was decided to develop the code in C language as it is the most robust solution in terms of power consumption.

The firmware of the device is based on the central-peripheral paradigm of the Bluetooth protocol assigning, in this case, the role of peripheral to the device. In this configuration, to be able to connect the device to the mobile phone and subsequently carry out the synchronization, the device must first be in the state called “advertising” in which it sends messages globally so that the rest of the Bluetooth receivers can have access to them. The mobile phone can then detect the device and connect to it, then the message is no longer sent and the communication between devices is determined by the so-called connection parameters, which, among other settings, allows energy consumption to be adjusted. Once the device and mobile phone are paired, two features based on key functionalities of the Bluetooth protocol, services and their characteristics, are used:

- **Battery service**, that has a *universally unique identifier (UUID)* predefined in the Bluetooth protocol so that it is recognizable by all devices subscribing to this standard.

- **Customer service**, created in this application, with the purpose of controlling the actions that are performed once the alarm button has been pressed. In this case, the *UUID* of the service is not within the standard, so it will not be automatically identified by other devices.

The **battery service** allows all receivers that have access to the device to read the battery level. This is a representation of the battery capacity as a percentage, although the value provided by the chip is in a different format. The reading is carried out *via* an analog pin and is expressed in millivolts. Therefore, it is necessary to carry out a conversion by applying the necessary scaling factor so that 3.3 V (maximum value of the battery) corresponds to 100% and the minimum voltage, approximately 1.7 V refers to 0%, as at this voltage value the *SoC* would not operate properly. It is important to note that the battery value is read every 5 minutes and is only notified by the service characteristic if it changes from the previous value.

The **customer service** has its own characteristic without a predefined *UUID*, and its value can be read by any device. The values read consist of two bytes of information: one is for the alarm value and the other for additional information. In this characteristic, the state of the alert that the victim activates *via* the panic button is monitored. Three possible states have been defined:

- **NOTHING** is the base state of the alert, in which no danger exists, and no further action is required. The value of the characteristic is the hexadecimal value *FFCC*.

- **WARNING** is the danger state, it is activated by pressing the button with a short press (less than one second). In this case, data is sent to the mobile phone application. This state can be exited by means of the **FALSE ALARM** procedure or by switching to the ALARM state described below. The value of the characteristic is *0xFFAA*.

- **ALARM** is the state of alarm. It is activated by pressing the panic button with a long press (more than one second). In this case, data are also sent to the mobile phone application. This state can be accessed from either of the other two states and can only be exited by a RESET or by the **FALSE ALARM** procedure. The value of the characteristic is *0xFFBB*.

Finally, the **FALSE ALARM** procedure is a mechanism that has been programmed to allow the victim to deactivate the alarm in case of accidental activation. This is done by simply pressing the panic button 10 times.

Since one of the key objectives of this design is to achieve a very small size so that it can be camouflaged in everyday objects worn by the victim, the *Wafer Level Chip Scale Package (WLCSP)* nRF51822 circuit has been used. It has its terminals arranged in the lower plane, making it the smallest in size of the series. The choice of this type of package also influences the choice of the balun. As can be seen in **Figure 5**, showing the schematic of the designed circuit, the ultraminiature balun BAL-NRF02D3 by ST Microelectronics is used, as recommended by the manufacturer [27]. The circuit also includes 16 MHz and 32 kHz quartz crystals and filters that attenuate noise in the controller.

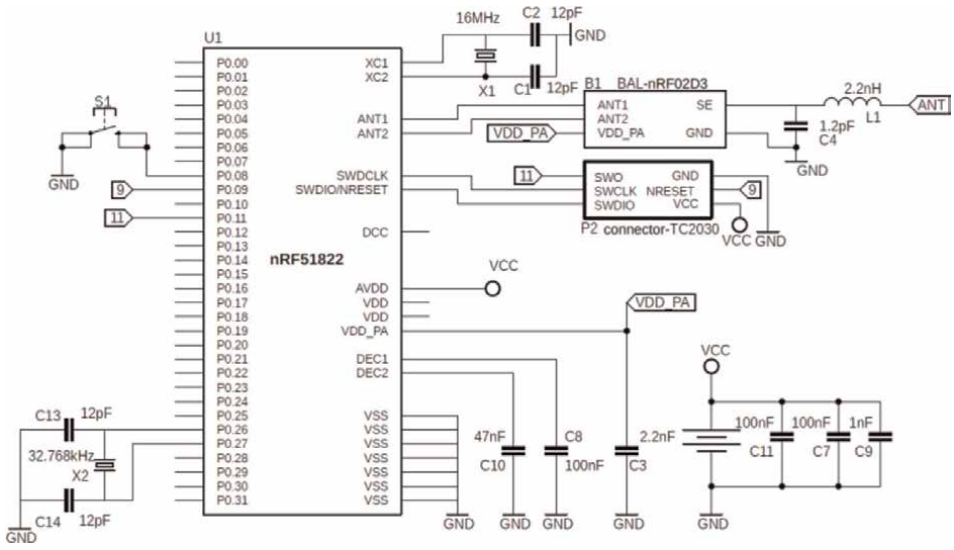


Figure 5.
Schematic of the designed circuit.

The *printed circuit board (PCB)* has been designed with a shape that is similar to that of the nRF51822-beacon kit [28]. As a power supply, the device uses a CR1632 button cell battery. To increase the camouflage options of the device, two contacts have been added in which battery holders with different characteristics can be soldered to provide the device with greater autonomy or other necessary features. The antenna has been designed on the *PCB*, matching the impedance to the controller output by means of the balun. About the panic button, a model that slightly sacrifices the miniaturization of the design but achieves greater robustness is used. This prevents this element from breaking easily in stressful situations to which the victim may be exposed. For its placement, several contacts have been additionally included so that the panic button can be placed in another position or on the side of the device. The tab on the *PCB* has an essential role in the initial operation of the device and becomes irrelevant once the device has been programmed. It includes the contacts necessary for loading the executable file into the *SoC*, but once done and tested, it can be removed. Small holes have been included to facilitate the removal of the *PCB* tab.

Figure 6a shows the photograph of the assembled device where the panic button can be seen enclosed by a red line. Purple color has been chosen for the *PCB* because it is the color most associated with non-violence against women. The 3D-printed case that holds and allows the manipulation of the electronic device is shown in **Figure 6b**.

One of the main requirements of the device is that it can be hidden in different accessories of the victims, such as brooches, pendants, necklaces, earrings, watches, bracelets, and belts. The idea was that the device could be customized according to the victim's personal preferences in such a way that it could be incorporated into the victim's daily life and remain completely unnoticed by the aggressor. Because special attention must be paid to the coating materials of the device, as some problems have been reported with those with a high metal content, the designs have been made with this in mind. For example, the design of the pendant shown in **Figure 7** has been handmade by a designer who uses metal-free salt paste in her work.

Figure 6.
Photograph of the designed prototype and case: a) electronic device and b) thermoplastic structure made using a 3D printer.

Other proposals compatible with the camouflage of the developed devices are collars that can be in line with market trends. For example, the left part of **Figure 8** shows a design with details that make them suitable for different preferences. **Figure 8b** illustrates the prototype made in thermoplastic as it can be seen the electronic device can be concealed.

However, other possibilities may be preferable for the woman, for example, the use of earrings or a belt. In the case of a belt, the design can be made with an outer circumference through which a ribbon can be threaded. This ribbon can also be of the user's choice. The designer's belt is shown in (**Figure 9a**) and the one made as a prototype in plastic in (**Figure 9b**) where the embedded electronic device can be seen. In this case, the nRF52832 Bluetooth® 5 *SoC* from Nordic Semiconductors has been used [29]. Among all its functionalities, the device can transmit sound to a mobile application using its microphone. This functionality has been exploited in this work in such a way that the audio signal is sent to the mobile phone, which starts recording and saving the conversation. For this purpose, two versions of the mobile phone application have been developed: one operating on Android and the other on IOs.

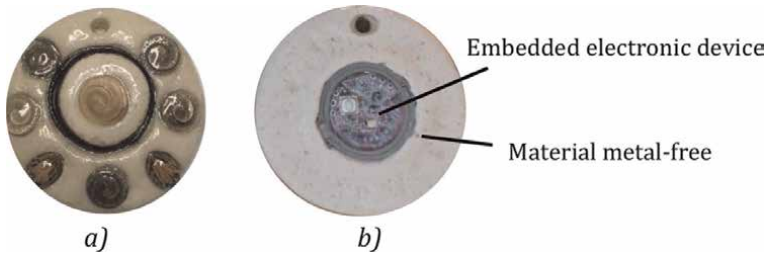


Figure 7.
Pendant made of metal-free material: a) front side and b) back side where the device is placed.

Figure 8.
Appearance of the necklace: a) proposed design and b) thermoplastic prototype with the hidden device.

Figure 9.
Device hidden in a belt: a) design of the accessory and b) prototype made of plastic with the electronic device inserted.

Other proposals to camouflage the device have been based on the use of analog clocks. To the best of our knowledge, the current alarm devices available on the market are based solely on the use of digital clocks without the possibility of customization, so another line of research has consisted of integrating the designed device into analog clocks. Several prototypes have been developed, such as a watch face made from a *double-sided PCB*, an adapter that can be placed inside the watch, and a *flexible PCB* that serves as a watch strap and can hold as many panic buttons as needed [30, 31]. The fact that *double-sided PCB* acts both as a support for the electronic components of a Bluetooth communications system and as a face for the watch and helps to reduce the dimensions to a minimum. **Figure 10** shows the portable device that has been designed so that it can be installed inside an analog watch without modifying its structure. In this way, its ability to go unnoticed is enhanced by the fact that it can be interchanged between different watches. It would thus be possible to have different watches in which to install the device that would be completely undetected by attackers. The mode of operation of these devices is like those described above, that is, in a situation of danger, and once the panic button inserted in the electronic device has been pressed, it sends a distress message to the control center. Similarly, other versions could be implemented in which the voice could be recorded in an internal storage memory, or the audio signal could be sent continuously (streaming) to the mobile phone for recording as possible legal evidence. The fundamental difference between the three versions lies in the battery life, which is maximum in the first version and minimum in the last one.

Regarding the device developed, as seen in **Figure 10**, the electronic components are distributed on a 0.4 mm thick *PCB*. The electronic circuitry, when the functionality is restricted to its use as a panic button, consists of the Fanstel's BlueNor BC832

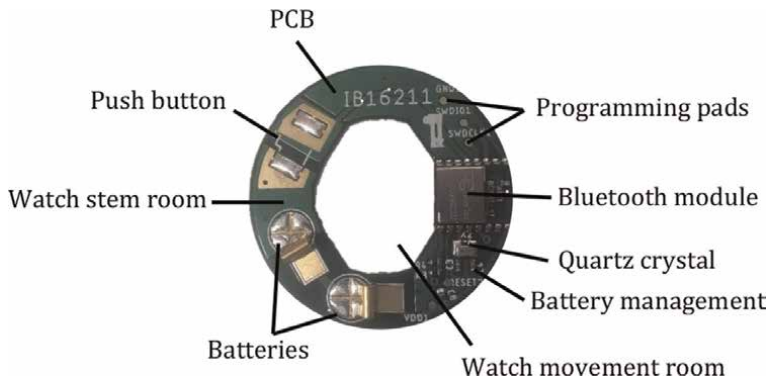


Figure 10.
Photograph of the designed watch adapter.

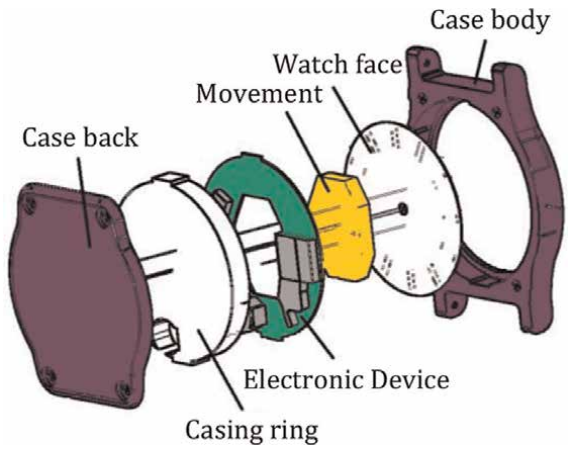


Figure 11.
Assembly of all parts of the watch including the adapter.

Bluetooth module, responsible for the wireless connection with the mobile phone [32]. This module, includes the Nordic Semiconductors nRF52832 *SoC* with ARM Cortex M4F microprocessor, flash memory of 512 kB, and a RAM of 64 kB. The operating power supply voltage can be adjusted in the range from 1.7 V to 3.6 V. Other components are a 32 kHz quartz clock, a push button that assumes the function of a camouflaged panic button, zinc-air batteries for power supply, and battery measurement and management electronics for detailed control of battery consumption.

The shape of the designed device is circular, with a central cavity of identical dimensions to those of the watch movement, so that it can be easily placed inside it. In this case, it is a standard one with the shape described in the figure, which corresponds to the Miyota 2035 type [33]. The dimensions reserved for its location are 18.20 mm x 14.11 mm and its height is 3.15 mm. In addition, it has a linear lateral room reserved for the placement of the watch stem (see the left side of **Figure 10**) so that it can be handled without difficulty. **Figure 11** shows the assembly of all the parts of the watch described above.

3.2 Mobile phone application

The complete assistance system includes the use of mobile phone applications, which have been developed for both Android and iOS operating systems. These applications are designed to be used by the victim and thus must be implemented to work in the background so that their operation is completely unnoticed by the aggressor.

The flowchart of the mobile application's mode of operation is illustrated in **Figure 12**. As can be seen, the routine starts with the device in “advertising” mode trying to establish a connection with the mobile phone.

This procedure can be seen in **Figure 13**, where the screenshot of the mobile phone with the icon of the application developed for Android is shown (**Figure 13a**), as well as the one (**Figure 13b**) during the search for devices. Once they are located, it displays their Bluetooth identifier and the option to pair the device. If this option is selected, the application indicates on its screen that the connection was successful, as shown in **Figure 13c**. If the device fails to pair with the mobile phone, it sends an error message to the control center alerting about it and continuing the pairing process.

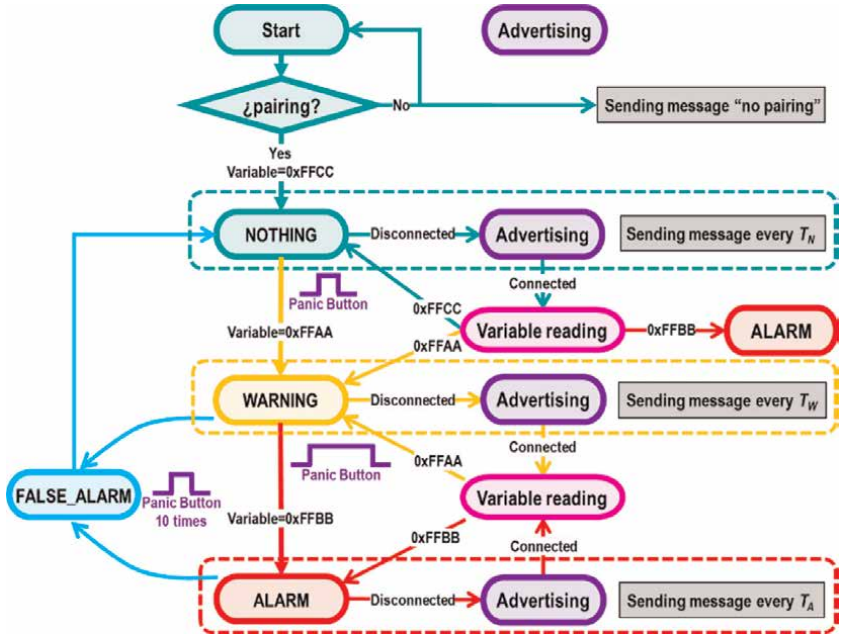


Figure 12.
Flowchart of the mobile phone application.

The device is initiated in the normal state, that is, no alert. Three configurable time parameters have been defined within the application: T_N, T_W, and T_A. These parameters correspond to the time intervals in which the application notifies the **NOTHING**, **WARNING,** and **ALARM** status, respectively, together with the location of the victim, to the control center. That is, in the normal operating state the electronic device sends a message to the control center every certain T_N time. These time parameters can be adjusted in the settings menu of the configuration

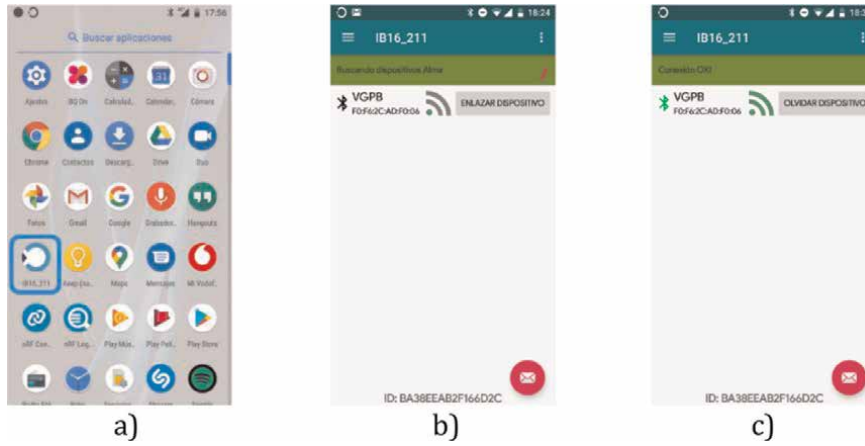


Figure 13.
Screenshot of the Android mobile phone application: a) application icon, b) searching for devices during the process of pairing and c) connection successfully established.

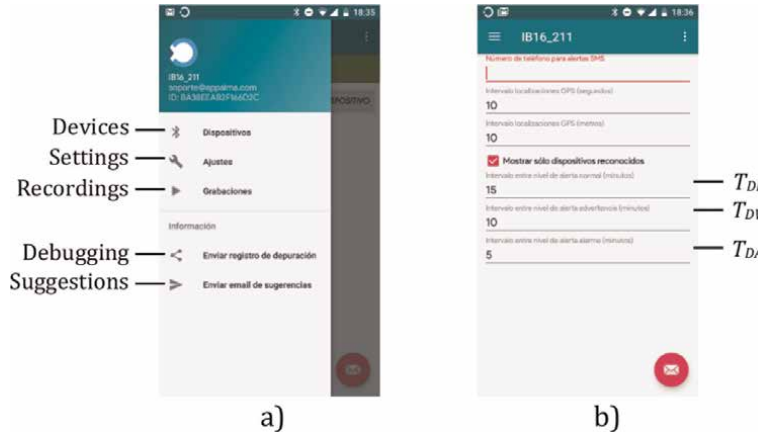


Figure 14.
Screenshots showing the configuration options of the Android application: a) configuration screen and b) configurable time parameters.

screen shown in **Figure 14a**. Specifically, **Figure 14b** shows the settings display where the time interval in minutes for different device status notifications can be selected. Other configurable parameters have also been included for debugging purposes.

Furthermore, as can be seen in **Figure 14a**, the application provides for the possibility that, if the alarm state is active, sound recordings are made in the telephone that can be sent to the control center. This facilitates, on the one hand, to evaluate the degree of danger of the victim so that a decision on how to proceed can be taken and, on the other hand, they can be provided, if necessary, as evidence in legal proceedings.

If, for any reason, the electronic device loses the connection with the mobile phone, then it automatically switches to "advertising" mode to be reconnected. The application would detect this fact and send a disconnection warning message to the control center. Once both devices are again paired, the status of the device is read and, if there has not been a change during the disconnection time, it returns to the normal operating state. If during the disconnection time the device is in any other state due to a warning or alarm, the application will recognize this new state and will proceed to send the respective warning messages to the control center every T_W or T_A time interval.

In the case of the victim activating the **WARNING** or **ALARM** states by mistake, these states could be reversed by pressing the panic button for 10 times. Thus, the **FALSE ALARM** would be detected, and the sequence would start again in a normal mode.

3.3 Control and monitoring center

Another essential element for comprehensive and effective care for victims of gender violence is the control and monitoring center, which is responsible for managing the operations to be carried out once the alert call is received. Its mission is to coordinate the actions established in the protocols of action referring to the police forces. For this purpose, a web platform has been developed to manage victims' information, locate them in the event of an alarm, and continuously monitor the different alert devices. Additionally, it is also used to carry out the activation and

deactivation of the devices in use, to obtain reports on their operation and to manage alerts and alarms.

The home page of the website is illustrated in **Figure 15** where, as can be seen, access is requested through an e-mail address and a password and is restricted to website administrators only.

Once logged in, the web administrator has access to the following options, as shown in **Figure 16**.

- Configuration
- Users
- Victims

Figure 15.
Home page of the website.

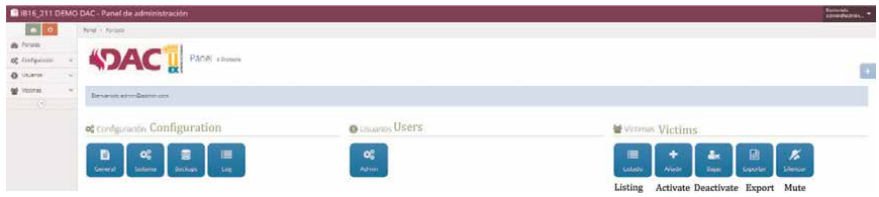


Figure 16.
Website administration panel.

The first two options are reserved for system administration and include information related to the control center contact details, system backups, system log files, and website access data. On the other hand, the victim's section includes a listing of victims and the options to activate and deactivate them. The listing provides information on the victim's data, the telephone number to which the electronic device is associated, the information on the last connection, as well as the status of the connection. The platform also allows downloading the information from the list of victims in different formats (CSV, Excel, or PDF).

4. Experimental results

The circuitry has been designed using low-power consumption techniques to allow for a long battery life. Given the high-stress situations experienced by the victims, it is very important that the stress is not increased by the possibility of the alarm device losing its functionality due to battery discharge. Since the electronic warning device is continuously sending packets of information to the mobile phone to check and record its correct functioning, the wireless modules have been programmed to operate in ultra-low power (*deep sleep*) mode to achieve considerable energy savings.

The power consumption testing and monitoring were conducted with two main objectives: to characterize the current consumption of the device—and therefore the battery life—and to know the range of the Bluetooth signal. The power consumption tests were performed using LabVIEW software [34]. The instruments used include the NI USB-6221 data acquisition card [35] and the Agilent 34401A digital multimeter [36]. The idle current was measured with the digital multimeter due to its low sampling frequency, which prevents the detection of the current peaks associated with the sending of Bluetooth data packets. The idle current measured was about 2.5 μA. On the other hand, a routine was implemented in LabVIEW to detect the sending of data packets and measure the peaks of current. The test was carried out using two digital inputs on the data acquisition board: one to measure the device's current consumption and the other to monitor the voltage of the battery. Both inputs were configured as fully differential. To measure the current consumption, a 10 Ω resistor was placed between the button cell and the circuit to determine the voltage and then calculate the current. **Figure 17** shows the oscilloscope screenshot corresponding to the voltage across the resistor. As can be derived from the measurement, the peak current is approximately 12 mA.

Similarly, battery life was also tested. **Figure 18** illustrates the discharge plot of the CR1632 coin cell voltage versus time as a function of the number of transmissions per second. As can be seen, if the number of transmissions is limited to one per second, the battery has almost full capacity even after more than two months of operation and loses completely its functionality after approximately four months. As for the Bluetooth signal range, measurements were 10–12 meters indoors and about 45–50 meters outdoors, which is enough for the proposed application of the device.

To validate the functionality of the entire implemented system, field tests were carried out with the assistance of the *ALMA Association*, which contacted some victims of gender-based violence. They volunteered to use both the camouflaged device and the mobile phone with the application developed to perform the tests. For this purpose, they were registered on the website that operates as a control center and included in a list of victims as shown in **Figure 19**. This screen also displays the telephone number to which the electronic device is associated, the data of the last

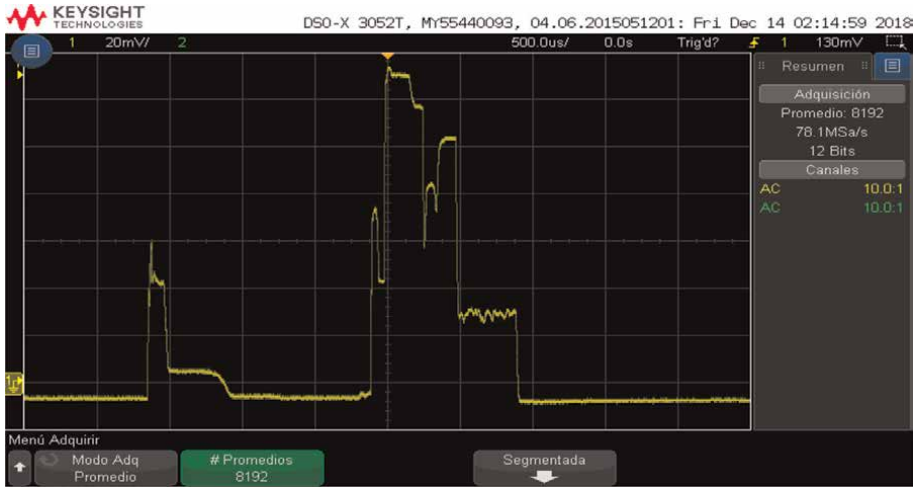


Figure 17.
Screenshot of the oscilloscope showing the demanded current peaks prior to sending information.

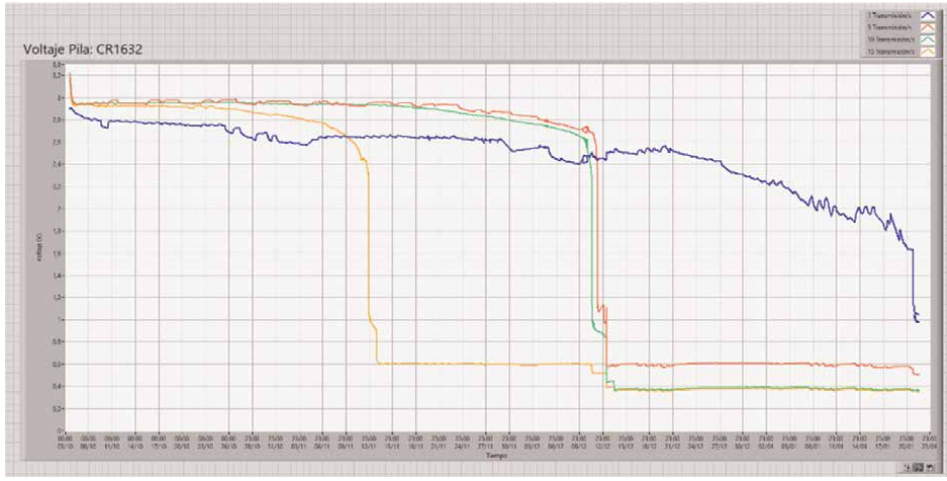


Figure 18.
Battery discharge voltage curve versus time and number of transmissions/s: blue: 1 transmission/s, red: 5 transmissions/s, green: 10 transmissions/s, and yellow: 15 transmissions/s.

Figure 19.
Screen with the information of the victims list.

connection, as well as the current connection status. In this case, the color codes used on the connection status buttons are green for **NOTHING**, yellow for **WARNING**, red for **ALARM,** and light blue for **FALSE ALARM**.

Figure 20.
Screen with a pop-up message of the victim in danger.

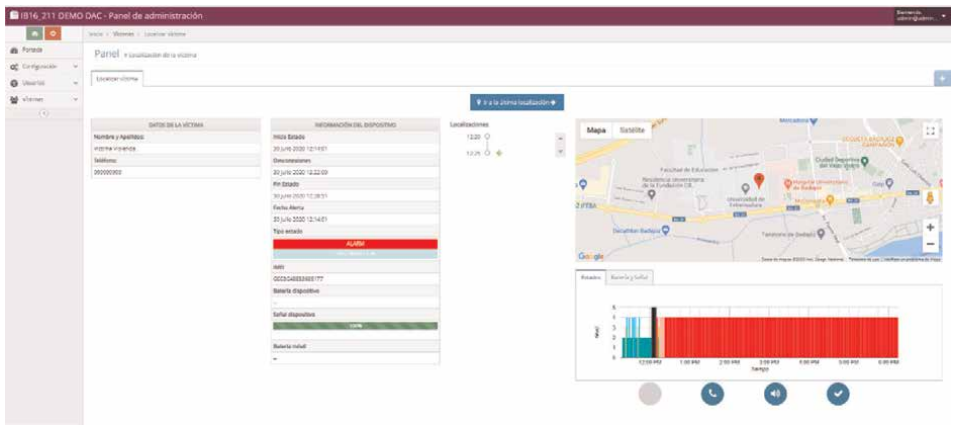


Figure 21.
Victim location window.

On the other hand, the right column shows the different options that can be accessed on this screen. From left to right, these options are as follows: location, which provides the victim's last location; view and edit, which allows the victim's information to be edited; and, finally, the icon to delete the victim, where the victim's data is deleted.

In case an alarm is activated, a window will pop up on the upper right-hand side of the screen, indicating the name of the victim and offering the option to determine the location, as depicted in **Figure 20**. Clicking on this option, the screen shown in **Figure 21** will be displayed, where, in addition to the location of the victim, other information is included, such as the device's status history for the last 12 hours, the data corresponding to the level of mobile phone coverage, the charge level of its battery, and the battery level of the electronic device.

Additionally, two action buttons are displayed on the screen; one is intended to play the audio sent by the mobile phone application, and the other is used to contact the victim so that their level of distress can be determined.

The complete system is still in the testing phase, pending on the approval by all the responsible institutions of the state, autonomous communities, and local bodies involved in the subject of gender-based violence.

5. Conclusions

An integral assistance system for victims of gender-based violence has been designed. The system consists of a camouflaged electronic alarm device, which

connects *via Bluetooth Low Energy* to a mobile phone that sends an alarm message to a control center in charge of monitoring the victims registered on its website. Along with the alarm signal, the location of the victim and an audio record of the threatening, which can be used as evidence in legal proceedings, are also sent so that police forces can assist the victim. The system has been developed paying special attention to a minimum power consumption requirement, a reduced size so that the electronic device can easily be camouflaged in any accessory of the victim's jewelry, and the option of audio recording among its possible features. The system is intended to be used by victims who still live with the aggressor and therefore have no other governmental protection mechanisms. These victims account for approximately 65% of all gender-based violence deaths.

Thanks

The authors are grateful to the *nonprofit association ALMA* for the invaluable assistance they provide to victims of gender-based violence and for supporting the development of this project. We would also like to thank the Government of Extremadura and the European Regional Development Fund *(Fondo Europeo de Desarrollo Regional, FEDER)* for financial help by project IB16211.

Author details

Miguel Á. Domínguez, Raquel Pérez-Aloe*, Bruno Pérez, Javier Lozano and Juan M. Carrillo
University of Extremadura, Badajoz, Spain

*Address all correspondence to: raquel@unex.es

References

[1] United Nations Office on Drugs and Crime. Global Study on Homicide. Vienna: United Nations Office on Drugs and Crime; 2018

[2] Sardinha L, Maheu-Giroux M, Stöckl H, Meyer SR, García-Moreno C. Global, regional, and national prevalence estimates of physical or sexual, or both, intimate partner violence against women in 2018. Lancet. 2022;**399**:803-813. DOI: 10.1016/s0140-6736(21)02664-7

[3] García-Moreno C, Pallitto C, Devries K, Stöckl H, Watts C, Abrahams N. Global and Regional Estimates of Violence against Women: Prevalence and Health Effects of Intimate Partner Violence and Non-Partner Sexual Violence. Switzerland: World Health Organization; 2013

[4] United Nations. Universal Declaration of Human Rights [Internet]. 1948. Available from: https://www.un.org/en/about-us/universal-declaration-of-human-rights [Accessed: February 09, 2022]

[5] United Nations. United Nation Entity for Gender Equality and the Empowerment of Woman. World Conference of the International Women's Year [Internet]. 1975. Available from: https://www.un.org/womenwatch/daw/beijing/mexico.html [Accessed: February 09, 2022]

[6] United Nations. United Nation Entity for Gender Equality and the Empowerment of Woman. Convention on the Elimination of all forms of Discrimination Against Women [Internet]. 1979. Available from: https://www.un.org/womenwatch/daw/cedaw/cedaw.htm [Accessed: February 09, 2022]

[7] United Nations. United Nation Entity for Gender Equality and the Empowerment of Woman. World Conference of the United Nations Decade for Women: Equality, Development and Peace [Internet]. 1980. Available from: https://www.un.org/womenwatch/daw/beijing/copenhagen.html [Accessed: February 09, 2022]

[8] United Nations. United Nation Entity for Gender Equality and the Empowerment of Woman. World Conference to review and appraise the achievements of the United Nations Decade for Women: Equality, Development and Peace [Internet]. 1985. Available from: https://www.un.org/womenwatch/daw/beijing/nairobi.html [Accessed: February 09, 2022]

[9] United Nations. United Nation Entity for Gender Equality and the Empowerment of Woman. Fourth World Conference on Women [Internet]. 1995. Available from: https://www.un.org/womenwatch/daw/beijing/fwcwn.html [Accessed: February 09, 2022]

[10] Council of Europe. European Court of Human Rights. Convention for the Protection of Human Rights and Fundamental Freedoms [Internet]. 1950. Available from: https://www.echr.coe.int/Documents/Convention_ENG.pdf [Accessed: February 09, 2022]

[11] European Parliament. Combating violence against women [Internet]. 2004. Available from: https://www.europarl.europa.eu/doceo/document/TA-6-2006-0038_EN.pdf [Accessed: February 09, 2022]

[12] European Parliament. Elimination of violence against women [Internet]. 2009. Available from: https://www.e

uroparl.europa.eu/doceo/document/TA-7-2009-0098_EN.html [Accessed: February 09, 2022]

[13] European Parliament. Istanbul Convention: Convention on preventing and combating violence against women and domestic violence [Internet]. 2011. Available from: https://www.europarl.europa.eu/RegData/etudes/ATAG/2021/698801/EPRS_ATA(2021)698801_EN.pdf [Accessed: February 09, 2022]

[14] Organic Law 1/2004 of 28 December, on Integral Protection Measures against Gender Violence

[15] Organic Law 3/2007 of 22 March, for Effective Equality between Women and Men

[16] Royal Decree - law 9/2018 of 3 August, on urgent measures for developing the State Pact against Gender Violence

[17] Ministry of the Presidency, Relations with Parliament, and Equality. Secretary of State for Equality. Government Delegation for Gender-based Violence [Internet]. 2016. Available from: https://violenciagenero.igualdad.gob.es/planActuacion/estrategiaNacional/docs/Estrategia_Nacional_Ingles.pdf [Accessed: February 09, 2022]

[18] Ministry of the Interior, Ministry of Equality, Judicial Council and Public Prosecutor's Office. Action Protocol for the Monitoring by Telematic Means of the Measures of Distance in Matters of Gender Violence. 2009

[19] ALMA. Non-profit Association against Gender Violence [Internet]. 2016. Available from: https://www.asociacion-alma.es/proyecto-alma [Accessed: October 25, 2022]

[20] Ministry of Equality. Government Delegation for Gender-based Violence. Statistical website [Internet]. 2021. Available from: https://violenciagenero.igualdad.gob.es/violenciaEnCifras/victimasMortales/fichaMujeres/home.htm [Accessed: October 25, 2022]

[21] Flic. Simplify Life [Internet]. 2017. Available from https://flic.io/ [Accessed: December 22, 2022]

[22] HelpySafe. Connected to life [Internet]. 2018. Available from https://helpysafe.com/ [Accessed: October 20, 2022]

[23] Minew B10 Emergency Button [Internet]. 2018. Available from https://www.minew.com/product/b10-emergency-button/ [Accessed: September 11, 2018]

[24] Kwema. La joya inteligente [Internet]. 2017. Available from https://rolograma.com/kwema-el-nuevo-invento-que-pretende-acabar-con-las-agresiones-y-la-violencia-de-genero/ [Accessed: December 03, 2018]

[25] The S.O.S. Bracelet [Internet]. 2016. Available from https://safelet.com/es/home-es/ [Accessed: January 23, 2017]

[26] Nordic Semiconductors. nRF51822 Bluetooth Low Energy and 2.4 GHz System on Chip [Internet]. 2012. Available from: https://www.nordicsemi.com/products/nrf51822 [Accessed: November 02, 2017]

[27] ST Microelectronics. BAL-NRF02D3 [Internet]. 2016. Available from https://www.st.com/en/wireless-connectivity/bal-nrf02d3.html [Accessed: November 02, 2017]

[28] Nordic Semiconductors. nRF51822 Bluetooth Smart Beacon Kit [Internet]. 2012. Available from: https://www.nord

icsemi.com/Products/reference-designs/nrf51822-beacon-kit [Accessed: November 02, 2017]

[29] Nordic Semiconductors. nRF52832 Versatile Bluetooth 5.3 supporting Bluetooth Low Energy, Bluetooth mesh and NFC System on Chip [Internet]. 2017. Available from: https://www.nordicsemi.com/products/nrf52832 [Accessed: December 22, 2018]

[30] Domínguez Puertas M A, Pérez-Aloe Valverde R, Pérez González B M, Carrillo Calleja J M, Duque Carrillo J F, Valverde Valverde J M, Lozano Oliva J. Dispositivo inalámbrico de auxilio (Wireless Assistance Device). Spain Utility Model 1 261 088; 2021-05-10, 2021

[31] Domínguez Puertas M A, Pérez-Aloe Valverde R, Pérez González B M, Carrillo Calleja J M, Duque Carrillo J F, Valverde Valverde J M, Lozano Oliva J. Correa de reloj electrónica para la solicitud de auxilio (Electronic watch strap for assistance request). Spain Utility Model 1 269 094; 2021-09-15, 2021

[32] Fanstel. BC832, Micro BLE 5.2 Module for Wearable IoTs [Internet]. 2017. Available from: https://www.fanstel.com/bt832-1 [Accessed: January 28, 2019]

[33] Miyota. Movement Cal.2025 Standard [Internet]. 2010. Available from: https://miyotamovement.com/product/Super+2035/ [Accessed: January 28, 2019]

[34] LabVIEW. Entorno de Programación Gráfica [Internet]. 2011. Available from: https://www.ni.com/es-es/shop/labview.html [Accessed: February 28, 2017]

[35] USB-6221. National Instruments [Internet]. 2012. Available from: https://www.ni.com/es-es/support/model.usb-6221.html [Accessed: March 19, 2016]

[36] Keysight Agilent HP 34401A Multimeter [Internet]. 2002. Available from: https://www.keysight.com/us/en/products/digital-multimeters-dmm.html [Accessed: May 15, 2015]

Chapter 9

Perspective Chapter: Neurotoxins and Erythrocytes – A Double-headed Arrow

Sherine Abdelmissih

Abstract

The prevalence of aggression has become an increasing problem that threatens lives, from suicidal ideation to homicide. Multiple factors contribute to such issue, including genetic, psychological, familial, economic, environmental, dietary habits, endocrine disturbances, psychiatric disorders, and neurological disturbances, making it resistant to control. If key targets can be identified, it might be possible to find a cure. To date, glutamate has been one culprit involved in aggression, instigated by inflammatory mediators and reactive oxygen species. Monosodium glutamate as well as omega-3 and-6 polyunsaturated fatty acids -components of our modern diet- modulate the inflammatory state, hence, affecting brain and blood glutamate, the latter is an essential neurotransmitter sharing in the antioxidant capacity of erythrocytes. Hence, the erythrocytic or blood glutamate assay, along with members of the inflammatory cascade, might be a cost-effective diagnostic and prognostic tool for aggressive behavior, especially feasible for assessing the efficacy of the intervening dietary and/or pharmacological measures to prevent such potentially devastating behavior.

Keywords: aggression, glutamate, monosodium glutamate, omega-3 fatty acids, omega-6 fatty acids

1. Introduction

Neurotransmitters in the brain are classified into inhibitory and excitatory. Each single neurotransmitter is a gear in an engine whose release is crucial for the brain's equilibrated machinery to proceed. The overflow of one neurotransmitter draws a cascade of events that disturb this discrete brain signaling, so does its deficiency. Accumulation of glutamate (Glu), the most abundant amino acid excitatory neurotransmitter, has been implicated in many neurological disorders, including aggressive behavior and the tendency to violence [1].

Exposure to ongoing or anticipated threatening events provokes a multitude of instinctive behavioral reactions, that enhance the ability to accommodate, survive, and sustain the stress, whether acute or chronic [2]. Among humans, stress-related behavior might be controlled relative to the magnitude of stress and its foreseen consequences; but in other cases, it might extend far beyond logic thinking and rational control, building up a crescendo aggressive attitude, that, instead of being a

reactive physiologic response, becomes an intuitive pathologic one, that, even, needs no impulse to ignite.

Since the brain is not totally segregated from the peripheral system, variations of blood Glu can mirror brain Glu turbulence, hence, blood assays have been suggested to diagnose and follow-up neurological diseases. Assaying blood Glu might offer a non-invasive, cost-effective, and quantitative way to assess aggression for a better control, comparing the potency and efficacy of various interventions that address this issue. Therefore, we can gather and analyze data, derived from blood assays of glutamate and inflammatory markers in cases exhibiting aggressive behaviors, to be invested for future implementation of treatment plans and optimum choice of medications, instead of a trial-and-error policy that wastes the time and delays improvements in which timing would be critical for the patient and his/her family, or surroundings.

2. Aggression

2.1 Types of aggression

Albeit some difficulty to differentiate between aggressive acts that are reactive and defensive and those that are intentionally destructive, yet psycho-socialists have defined aggression as a forceful physical or symbolic action that can be motivated (instrumental or proactive, and affective or reactive aggression), or deliberately damaging (aggression), whether directed to other person that does not wish to be harmed, living creature, the environment, or one's self, leading to physical or psychological harm [3]. So depending on the intent of the act, affective, reactive, defensive, or impulsive aggression is characterized, so that tough responses are not intended to harm. The opposite would be the predatory, premeditated, instrumental, proactive, or cognitive aggression when the intention is to hurt someone [4].

Not all aggressive reactions are physical, some can be psychological, verbal, sexual, social, or racial. The type causing actual physical harm is termed "violence" and is the extreme of aggression [5]. Nonphysical aggression is the more common to observe, yet the more difficult to track and punish, see examples [6, 7].

In terms of pharmacotherapeutics, we have the treatable secondary or medical aggression, related to psychologic disorders that respond to medications, including antipsychotics and antimanics, and the primary impulsive aggression that is addressed using other specific agents [8], although, in absence of psychopathology, seems resistant to manage [9].

2.2 Epidemiology of aggression

Two-million people are annually exposed to workplace violence, with 50% of cases falling among healthcare workers, and 7% of fatalities are ascribed to physical harm. Domestic violence affects 10 million people yearly in the United States, with an economic burden of more than 12 billion dollars per year. These estimates are expected to rise over the next 20 years [10].

Lifestyle changes during the coronavirus disease (COVID-19) pandemic, including the distress of getting infected [11], poor sleep quality, a higher prevalence of post-traumatic stress disorder among hospitalized patients [12], and the social isolation

of the recommended lockdown, increasing the incidence of domestic violence and abuse toward children, in case of a violent family member, with limited access to community-based support and assistance [13], provoked depression, anxiety, and suicidal behavior [14]. The evolving stressful life conditions that followed the COVID-19 lockdown triggered violent attitudes and mental health issues, consequent to unemployment, and financial instability, while struggling to satisfy the basic needs of life, being helpless to find new job opportunities, and losing the liberty to have interactive social conversations and relations, concurrent with the compounded feeling of loneliness, uncertainty, and trepidation, considering the "others" potential threats of disease transmission. Neurological symptoms during the pandemic were variable and included suicidal behavior, agitation, paranoid delusions, bizarre behavior, and weird posture [15, 16]. Assumptions were made about the involvement of encephalitis [17, 18] and medications used in the treatment protocol of COVID-19 such as steroids, chloroquine derivatives, and benzodiazepines [19].

2.3 Aggression as related to other medical issues

Among health problems, pain was the most significant medical issue that can lead to aggression. Reports advocated respiratory distress as a cause of aggression [20].

Neurological disorders can provoke aggression as in some cases of attention deficit and hyperactivity disorder, autism, epilepsy, and Alzheimer's disease (AD) [21].

Psychological issues complicated by secondary aggression include bipolar affective disorder, schizophrenia, major depression, general anxiety disorder, post-traumatic stress disorder, and antisocial personality [22]. Substance abuse and/or withdrawal was an undeniable culprit, especially alcohols and hallucinogens [23].

Anemia, one of the most prevalent worldwide [24], was involved in aggressive cases [25–27]. Furthermore, iron deficiency can contribute to mood and behavioral disturbances, owing to its crucial role as a co-enzyme for the production and release of neurotransmitters [28].

Iatrogenic aggression can be seen with medications such as dopaminergic agents [29], antidepressants [30], glucocorticoids, testosterone, and androgenic steroids [31].

2.4 Diagnosis and management of aggression

There is no consensus concerning laboratory or imaging tools to diagnose aggression. But assessments converge on reporting either the consequences or some etiological factors such as substance abuse, toxicological screening, or psychological disorder [10]. While most pharmacologic treatments have long converged on controlling the causative factors of aggression, now, addressing the deliberate hostile behavior as an isolated disorder is getting more attention.

Experimental dietary manipulation deterred 2-year aggression in a dog using a diet regimen whose plan was based on hematologic, biochemical, and imaging investigations [32].

Presumably, investigating key mediators of aggression might help control primary aggression, for which psychological assessments failed to find a clue. Researchers suggested neuronal mediators that might lower the aggression threshold, including, but not limited to, dopamine (DA), serotonin (5-HT), gamma-amino butyric acid (GABA) [33, 34], and glutamate (Glu) [35].

3. Glutamate

3.1 Glutamate as brain neurotransmitter

Glutamate (Glu) is a nonessential and most abundant free amino acid, excitatory neurotransmitter in the brain. It is released through the glutamate-cystine exchange system (xC-system) in exchange of cystine at a 1:1 ratio, also used for the synthesis of the brain antioxidant, glutathione (GSH). Its central existence is not limited to the synapse, but it projects to extra-synaptic sites through ionotropic (iGluRs) and metabotropic glutamate receptors (mGluRs) [36]. The ionotropic receptors comprise three types, N-methyl-D-aspartate (NMDA), 2-amino-3-(3-hydroxy-5-methyl-isoxazol-4-yl) propanoic acid (AMPA), and kainate.

To establish a synaptic neurotransmission, glypicans, the synapse-forming proteins secreted by astrocytes, increase the number and activity of postsynaptic AMPA receptors, amplifying the electrical current to open the Mg^{2+}-gated NMDA receptors. In the brain, micromolar levels of glycine, an inhibitory neurotransmitter, are sufficient to saturate NMDA for full functioning [37]. The ionotropic receptors are connected to their intracellular second messengers, stargazine, D-serine, and nitric oxide synthase, by postsynaptic density proteins (PSD95) [38], controlled by the immune (glial) cells, astrocytes, and microglia [39].

Glu diffuses binds to mGluRs on the astrocytic surface, triggering the release of the chemokine, CXCL12/stromal cell-derived factor (CXCL12/SDF1) [40], implicated in preclinical models of anxiety [41], urging microglia to release small physiologic quantities of tumor necrosis factor-alpha (TNF-α) [42]. By binding to astrocytes, TNF-α regulates Glu clearance, to ensure a well-controlled neuronal excitation, by immune-to-glutamate signaling [43].

The glial cells, microglia, astrocytes, and oligodendrocytes, communicate on a large-scale [44], conveying transsynaptic information along large brain regions [45]. The net result would be a presynaptic Glu release propagated and reflected on Glu release and uptake at distant sites [46].

Astrocytes, of the fibrous type, nurture and protect the unmyelinated nodes of Ranvier, while oligodendrocytes exert the same function for myelin sheath and cells [47]. While astrocytes of the fibrous type expand the white matter of the brain, astrocytes of the protoplasmic type span the gray matter of the brain, branching multiple times to yield fine processes that encase blood vessels at one end, forming part of the blood–brain barrier (BBB) [48], while surrounding thousands of synapses forming "astrocytic cradles" [47], provided with plenty of Glu transporters, that mediate Glu clearance [38] and keep Glu from spilling over into the extra-synaptic space [49].

Glu is cleared by excitatory aminoacids transporters (EAAT) of the endothelium of cerebral blood vessels as well as by passive diffusion through BBB to the systemic circulation [50, 51]. The EAATs-mediated Glu uptake is impaired during immune activation (**Figure 1**) [52–58].

Interestingly, reducing plasma Glu accelerated its clearance from the brain to the blood. Pharmacologically, this can be accomplished by the administration of inducers of the Glu metabolizing enzymes, serum Glu oxaloacetate (SGOT), and serum Glu pyruvate transaminase (SGPT) [43]. Experimentally, this Glu scavenging policy was successful to counteract excitotoxicity in animal model of stroke [59].

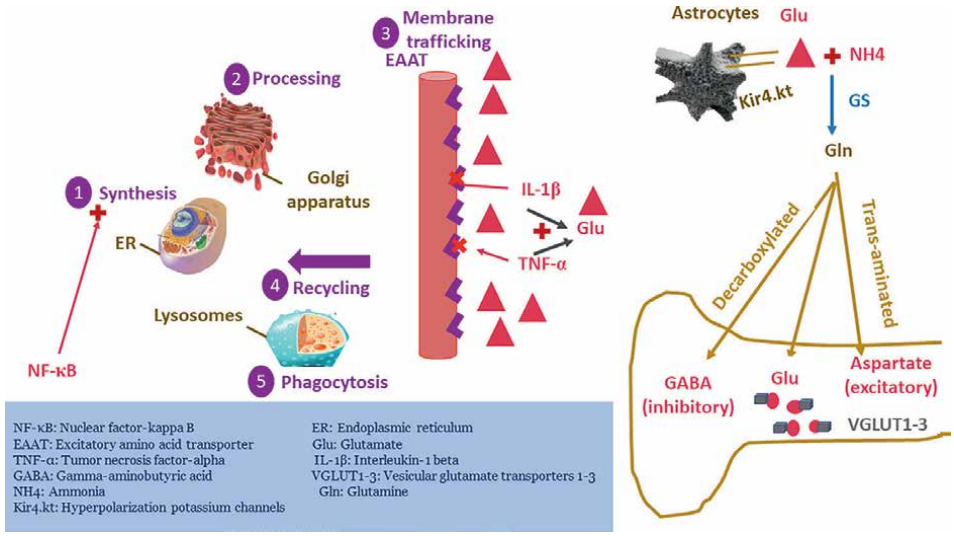


Figure 1.
Glutamate clearance and immunomodulators. Glu is taken up by astrocytes, driven by Kir4.Kt, where both Glu and NH_4 yield the inert, Gln, by the action of GS. de novo Gln is transported to neurons either, to be re-converted to Glu, or to be transaminated to aspartate, or to be decarboxylated to GABA. Glu, synthesized from Gln, is packaged and stored in synaptic vesicles via VGLUT1–3. Membrane EAATs are synthesized in the endoplasmic reticulum and modified in the Golgi apparatus, before their expression on the surface. Their gene promoters are responsive to NF-κB. This is followed by their internalization either to recycle back to the surface or to be phagocytosed by lysosomes. EATTs are suppressed by TNF-α and IL-1β, rendering them insufficient for Glu clearance.

3.2 Glutamate and aggression

An epigenetic mutation in the promoter region of *BEGAIN*, the gene expressing PSD95, involved in Glu receptors signaling, was identified in postmortem specimens of suicidal depressed patients [60]. A preclinical model of prenatal viral exposure incriminated in schizophrenia and autism spectrum disorders resulted in reduced PSD95, with overwhelming behavioral chaos [61].

Exposure to stress reduced a specific type of oligodendrocytes, NG+ cells, in laboratory animals [62], that share in glutamatergic and GABAergic synapse formation [63, 64], eventually impairing EAATs, with subsequent brain Glu overload [62].

A hypothalamic hamartoma (a congenital malformation) with excessive glutamic acid decarboxylase (GAD), enzyme involved in the synthesis of GABA from Glu, was accompanied by impulsive aggression, which improved after surgical resection of the deformity [65]. Glu has been targeted by various antiepileptic medications, many of which were successfully introduced in psychiatry to control psychopathologic aggression [66].

Experimental animals can be used to model both types of aggression, hyperarousal or defensive, and hypo-arousal or predatory, corresponding to the impulsive and proactive types in humans, respectively. In different species, from fish to humans, Glu was implicated in the hypothalamic elicit of impulsive aggression [67]. Despite the involvement of other neurotransmitters in aggression, such as DA and noradrenaline (NA), yet it seems that they operate through glutamatergic neurons. Preclinical research indicated that Glu might be the leading mediator of aggression, as identified in cats, rats, and hamsters [68, 69]. Genetic studies in mice linked the severity of aggressive traits to the Glu ionotropic receptor AMPA3 gene (Gria3) [70]. More

astonishing was that in mice subjected to social isolation and depicting aggressive behavior, NMDA subunits were highly expressed in the hippocampus, while down-regulated in the prefrontal cortex, the area of judgment and reasoning [71]. In human studies, the elevation of Glu in cerebrospinal fluid (CSF) was associated with impulsive aggression as well [1].

Nonetheless, the link between Glu and aggression is still confusing, noting the opposing effects of NMDA antagonists, when at the low dose they aggravate aggression, while at a high dose they soothe aggression [36]. Further work is also needed to track discrete Glu circuity in specific brain areas.

4. Blood glutamate and brain glutamate: a double-headed arrow

In erythrocytes, as in brain, a continuous Glu supply is required to synthesize the antioxidant, GSH, along with cysteine and glycine, by aid of the enzymes, glutamate cysteine ligase (GCL) and GS. As the erythrocytic cell membrane is impermeable to Glu [72], erythrocytes synthesize de novo Glu from either alpha-ketoglutarate using alanine aminotransferase (ALT), and aspartate aminotransferase (AST), or Gln using glutamine aminohydrolase (GA) [73]. As the oxidant, hydrogen peroxide (H_2O_2), traverses readily; in diseases with oxidative stress, erythrocytes capacity to synthesize more GSH is increased, using the endogenous Glu precursors, Gln and/or alpha-ketoglutarate, which exogenous supply was demonstrated to accelerate this process [74]. Recently, GA was proposed as one of the most powerful predictors of COVID-19 prognosis, based on case reports of critically—ill patients, indicating glutaminolysis and shift of glycolysis from anaerobic to aerobic, enriching Gln/Glu metabolic pathways, as was formerly detected in seizure disorders and inflammatory diseases [75].

Immune cells express Glu cognate receptors that regulate their functions. T-lymphocytes exhibit both iGluRs and mGluRs that respond to Glu in a dose-dependent way. In the nanomolar-micromolar range, Glu acts on ionotropic receptors, stimulating T-cells migration, and proliferation. In pathologic conditions, at high millimolar Glu concentration, metabotropic receptors are activated leading to suppression of T-cells proliferation, versus increased inflammatory cytokines release. By acting on mGluRs, Glu induces the apoptosis of memory and naïve B-lymphocytes [76].

In turn, iron deficiency anemia was involved in irreversible fetal brain alterations of excitatory and inhibitory neurotransmitter receptors. In a study [77], using an experimental model of stroke due to intracranial hemorrhage, several blood components modified the AMPA- and NMDA-mediated synaptic responses. While the whole blood inhibited the synaptic activity; diluted blood precipitated a prolonged epileptic NMDA synaptic activation; plasma and part of leukocytes evoked neuronal epileptiform discharges; and fraction of red blood cells, initially, stimulated the receptors, followed by their depression. In cerebral ischemia, brain Glu was found to rise [78], culminating into excitotoxicity [79].

Despite the inability of Glu to penetrate the BBB [80], the brain is not absolutely segregated from the effects of fluctuating blood Glu.

As a positive correlation has been reported between Glu levels in the blood and either CSF [81] or CNS [82], it was not surprising that, in 2018, Madeira et al. [83] assayed blood Glu and Gln in patients with recent onset and chronic schizophrenia to find that blood Gln/Glu ratio was increased with recent onset, versus decreased with long-standing disease. This complies with other studies reporting a low blood Glu with the first psychotic episode [84], versus high blood Glu in cases with chronic

schizophrenia [85]. This peripheral Glu change was previously mirrored in the brain by increased CSF Glu in chronic cases and a high Gln/Glu ratio in CSF of new-onset disorder [81].

In terms of pharmacological approach, typical antipsychotics were associated with lower blood Gln/Glu ratio than with atypical medications of the same category [83]. The inconsistent link between blood and brain Glu could be related to the altered eating behavior induced by either the atypical antipsychotics [86] and/or the disease itself [87].

5. Diet, glutamate, neuroinflammation, and neurotoxicity

5.1 Monosodium glutamate (MSG): a glutamate receptor agonist

Monosodium glutamate (MSG) is the sodium salt of *L*-glutamic acid. It is a natural dietary component found in dairy products as Roquefort and Parmesan cheese, and vegetables such as tomatoes, mushrooms, and broccoli. The unique taste of MSG, known as an essential component of the Asian cuisine, evoked its widespread use in restaurants and canned food all over the world to improve food palatability. The L-glutamic acid itself and its disodium salt have a milder taste. The average daily intake in humans ranges from 0.3 to 1.0 g [88].

Despite being generally recognized as safe (GRAS) by the food safety regulatory agencies, animal and human studies continue to raise concerns about its potential toxicity. In 2006, the European Food Safety Association (EFSA) included MSG in the list of food additives for which established acceptable daily intake (ADI) was reassessed to be 30 mg/kg, considering its no-observed adverse effect level (NOAEL) that is 3200 mg/kg.

Focusing on its neurotoxicity, MSG has been alleged of causing stroke, epilepsy, schizophrenia, anxiety, depression, and AD [89], all of which predispose to aggression. This food additive acts on Glu receptors, triggering an array of inflammatory events and oxidative stress [90], especially with chronic consumption of high doses [91]. By binding to hepatic Glu receptors, excess NH_4 ions are produced, with the secondary generation of reactive oxygen species (ROS), and eventual hepatotoxicity [92], impairing MSG metabolism, leading to its blood accumulation, and increasing the likelihood of neurotoxicity. Downregulating mGluRs and NMDA receptors was one of the protective mechanisms exerted by curcumin against MSG neurotoxicity [93].

Multiple experiments tracked the behavioral and neurochemical events associated with MSG [94–99]. Notably, extrapolating animal studies employing the systemic route of administration to human practice may flaw results interpretation, bypassing the usual metabolic breakdown of oral MSG ingested in food [100].

Interestingly, a positive link was detected between MSG and hemoglobin levels [101] and it was found to reduce the percentage of blood lymphocytes as well [102]. Moreover, the oxidative stress during MSG toxicity overwhelmed the Glu-derived antioxidants generated by erythrocytes [103].

5.2 Omega-3 (ω3) versus omega-6 (ω6) long-chain polyunsaturated fatty acids (LC-PUFA)

Polyunsaturated fatty acids (PUFA) are those containing two or more carbon double bonds, classified as omega-3, -6, and -9. Among long-chain polyunsaturated fatty acids (LC-PUFA), omega-3 (ω3), and omega-6 (ω6) can be discriminated. While

the literature recommended the addition of ω3 sources in the diet, they advised to limit the consumption of its nonidentical twin, ω6. A debatable issue was to whether focus on the relative ω6 to ω3 consumption, versus determining absolute figures for each [104].

Despite being essential FA, ω6 PUFA have a narrow therapeutic window, requiring a rational dietary consumption to establish physiologic, rather than deleterious effects [105]. The major dietary ω6 is linoleic acid (LA), converted to other ω6 products as γ-linolenic acid and dihomo-γ-linolenic acid, and from which arachidonic acid (AA) is derived, yielding pro-inflammatory molecules and ROS. Rich sources of LA are vegetable oils such as corn, sunflower, soy, and canola oils, while AA is present in meat and eggs mainly [106]. The recommended daily intake of LA in adult men is 17 g/day, to be further reduced for adult women to 12 g/day [107].

On the other side, the major component of ω-3 PUFA is the alpha-linolenic acid (ALA), contained in chia seeds, black walnuts, and soybean oil, and converted in the liver to docosahexaenoic acid (DHA), eicosapentaenoic acid (EPA), and decosapentaenoic acid (DPA) [108, 109]; the latter is a potential reservoir for DHA and EPA [110]. The consumption of fatty fish, such as salmon, herring, sardines, mackerel, and cod liver oil, or the substitution with fish oil, as rich sources of ω3 PUFA, was adopted to improve neurological functions, especially that relevant synthesizing enzymes are lacking [111] and the plant-based sources containing ALA are insufficient for humans [112], due to the incomplete hepatic conversion to EPA and DHA [113].

The fatty acid composition of the brain consists of palmitate, AA, an ω6 PUFA, and DHA, as the major ω3 PUFA, other members of the latter group are present, but in very small quantities [114]. The brain depends on the uptake of ω3 PUFA from dietary or liver sources. Once absorbed from diet, ω3 PUFA are transported by lipoproteins and albumin to the blood stream [115]. In adult mice, blood and brain levels of ω3 PUFA (DHA and EPA) were dependent on dietary consumption [116]. Free fatty acid receptor (GPR40), which ligands include several medium and LC-FA, saturated or unsaturated, is ubiquitously expressed in the brain. If ω6 binds to GPR40, neurodegeneration follows. If the ligand is ω3, serum BDNF is increased with eventual synaptogenesis and neurogenesis [117].

Poor nutrition has long been declared as one of the risk factors to antisocial personality disorder in adulthood [118] and increased aggression during childhood and adolescence [119]. A defective supply of DHA from ω3-PUFA, an integral part of astrocytic cell membrane, caused an impaired Glu clearance, with subsequent altered behavior in adulthood [120]. Several human studies adopted ω3 PUFA to hinder aggression [121–127]. Omega-3 deficiency favors the production of inflammatory cytokines, disturbing Glu homeostasis (**Figure 2**) [43, 128–132]. Inflammation was linked to aggressive behavior in lower mammals and humans [133, 134]. There seems to be a bidirectional interaction, so that aggression by itself can precipitate oxidative stress, as was demonstrated in birds subjected to a violent interaction [135].

Despite studies claiming the benefits of ω3 PUFA in neurological disorders, a lack of consistency remains. Moreover, most studies addressed ω3 PUFA without discrimination between individual constituents. Scarce work investigated ω3 short-chain PUFA claiming their additional neurological benefits [136]; however, insufficient data exist at the current time.

In blood, erythrocytes content of ω3 PUFA is dependent on either exchange with plasma lipoproteins, in the case of EPA, or erythrocytic turnover, in the case of DHA and DPA [137]. Surprisingly, giving EPA supplementation, but not DPA, was reflected at the level of erythrocytes. Other blood components seem to have a special

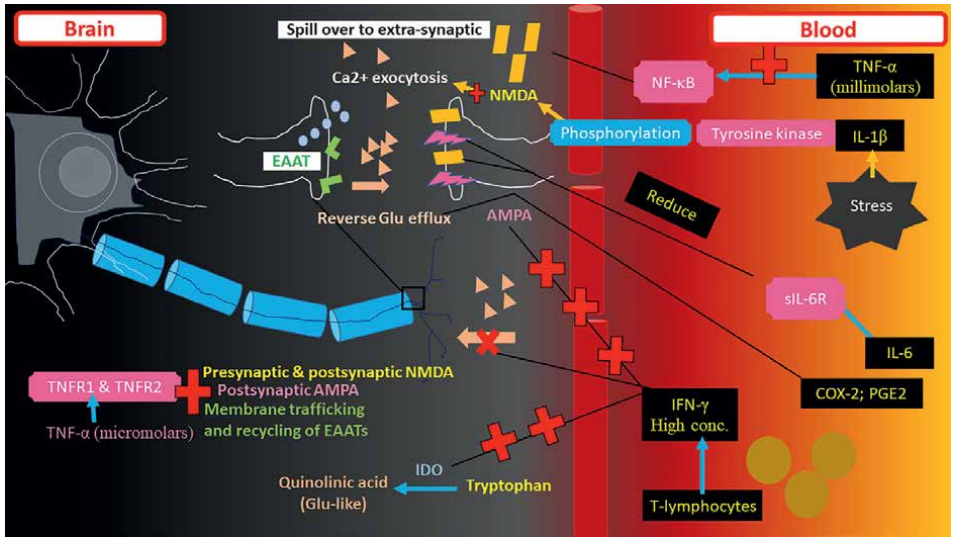


Figure 2.
Glutamate and neuroinflammatory mediators. Among inflammatory cytokines, tumor necrosis factor-alpha (TNF-α) upregulates 2-amino-3-(3-hydroxy-5-methyl-isoxazol-4-yl) propanoic acid (AMPA) receptors, on the expense of gamma-aminobutyric acid (GABA) downregulation. The rapid rise of TNF-α from micromolar to millimolar levels can lead to sustained nuclear factor-kappa B (NF-Kb) activation and neurotoxicity. A blunted TNF-α is not beneficial either, as by acting through its corresponding receptors (TNFR1 and TNFR2), it supports synaptic transmission by stimulating presynaptic N-methyl-D-aspartate (NMDA) and postsynaptic NMDA and AMPA activities, as well as assisting Glu transporters by regulating membrane trafficking of excitatory amino acid transporters (EAATs) and their recycling to the surface, added to conferring neuroprotection. Interleukin-1 beta (IL-1β), activated by stress, precipitates excitotoxicity by enhancing the postsynaptic NMDA pool and activity, by facilitating tyrosine kinase-mediated NMDA phosphorylation, increasing Ca^{2+} permeability. Interferon-gamma (IFN-γ), released from T-lymphocytes at high concentrations, can impair the sequestration of Glu by EAAT, induces tryptophan catabolism through activation of IDO, generating Glu-like compounds as quinolinic acid and enhances AMPA-mediated neurotoxicity. Interleukin-6 (IL-6) acts on soluble IL-6 receptor (IL-6R) to abrogate presynaptic Glu release and reduce AMPA and NMDA activities. Cyclo-oxygenase-2 (COX-2) and prostaglandin E2 (PGE2) trigger the release of Ca^{2+} from intracellular stores, causing reverse efflux of Glu by EAATs, followed by Glu spillover to bind to extra-synaptic NMDA.

affinity to supplements of different ω3 PUFA members. Blood levels and response to supplementation are subjected to multiple factors, related to genetics, gender, interindividual variability ranging from an 82% decrease to a 5000% increase, and the type of supplement used [138–141].

Many years ago, low blood ω3 was detectable in impulsive offenders [142]. Blood levels of ω3 were negatively correlated to behavioral indices of aggression [143]. Blood samples were recommended when dealing with ω3 supplementation, being better predictors of aggression, that can discriminate responders from no- or low-responders and can tackle interactions with other nutrients [127]. Recently, a total daily dose of 960 mg DHA and EPA was provided to adult male prisoners in a correctional center as fish oil capsules reduced their aggression, most of them were nonaggressive at baseline [144]. In this trial, non-fasted blood samples were withdrawn, and plasma was separated from packed erythrocytes. Then, erythrocytes were prepared for fatty acid analysis [145]. Individual fatty acid analysis was done, then ω3 index was calculated as the sum of EPA and DHA, to be expressed as the mol percent of total erythrocyte fatty acids [146]. Participants with an index of 6% or higher were unlikely to benefit from the supplements due to a potential ceiling effect [147].

Unfortunately, results correlating blood levels of ω3 PUFA to the brain levels showed inconsistencies, limiting their applicability as surrogate biomarkers for brain disorders, at least for the time being. In fact, ω3 and ω6 PUFA complement to maintain constant levels of unsaturated membrane phospholipids, so that they compensate for each other [148].

6. Blood–brain bridge, rather than barrier

The brain is no more that sealed-off structure from the rest of the body, as detected in mice lacking immune cells and depicting difficulty in social behavior [149]. Instead of crossing the brain, immune cells signal through cytokines, so that knocking out cytokine receptors on the neurons can disturb social behavior in laboratory animals [150]. In turn, the brain areas involved in positive emotions and motivation can alter immune responses in inflammatory and oncogenic disorders [151]. Although, in healthy humans, limiting the amount of Glu that crosses the BBB [152] protects brain Glu levels from fluctuations of blood Glu [99]. Glutamate can breach such restrictive entry by enhancing the blood-brain permeability, while triggering cerebral vasodilatation [153].

In vascular injury of the brain, whether ischemic or hemorrhagic, the concomitant sizeable rise of blood and brain Glu occurs [154]. Such elevations were also noticed in many neurological disorders, including AD, epilepsy, and schizophrenia [155]. Following traumatic brain injury, the rise of brain Glu persists for months or even years thereafter. Such BBB disruption, not only allows blood Glu to reach the brain, but prevents the escape of cerebral Glu to the bloodstream.

In primary hypertension, the increased arterial content of Glu was linked to the higher Glu entry into the brain [156]. Similarly, systemic injection of Glu exacerbated brain damage [157]. Conversely, medications that lower blood Glu can assist Glu efflux from the brain [158]. So, restoring Glu level in both blood and brain to normal levels is required to reestablish the brain–blood Glu homeostasis. In their review, Gruenbaum et al. [159] highlighted the disruption of Glu efflux, breaking the integrity of the BBB, suggesting the feasibility of blood Glu scavengers in the treatment of depression following stroke.

One applied entity is the stress-induced aggression. During an anger attack, blood perfusion is increased, contrasted by cerebral hypoperfusion in between attacks, owing to stress-induce cerebral vasoconstriction [160]. Chronic stress causes disorganized BBB integrity, permitting the influx of mediators from peripheral blood, causing oxidative stress and neuroinflammation [161]. Altering the blood–brain Glu balance can excite excess Glu exit from the brain. To revert aggression and other subsequent psychological issues, oxaloacetate (OxAc) [162], the substrate of the enzyme glutamate-oxaloacetate transaminase 1 (GOT), that consumes Glu to render OxAc, was given to reduce blood Glu level.

7. Tips for erythrocyte glutamate assay in CNS disorders

In the brain, Glu is taken up from the extracellular to the intracellular domain of neurons and astrocytes by bidirectional transport mechanisms that, not only maintains low/high extracellular/intracellular levels, but also acts as a source of extracellular Glu when low [163], through stimulating Glu release [164]. Similarly,

the Glu active transport in erythrocytes maintains a high erythrocyte/plasma (E/P) concentration and a low plasma concentration.

In children with migraine, erythrocytic Glu was employed to mirror a centrally enhanced cellular uptake of this amino acid. In this setting, measuring plasma and erythrocytic Glu revealed a significant decrease in plasma, with a higher E/P concentration which was suggested as a reflection to mishandled CNS Glu turnover [165]. In contrast to the pediatric age group, adult migraineurs experienced elevated plasma and platelets Glu when measured during the attack-free periods [166]. Recently, stress, an aggression trigger, was documented to affect blood Glu levels [167].

A blood assay of Glu should be obtained after an overnight fast, to enhance specificity, avoiding misinterpretation due to nutritional factors, unless dietary management is planned. A preferable practice would be to monitor plasma Glu at the fixed time of the day, if multiple testing is needed, as plasma Glu might fluctuate along the day [168]. For better and more accurate interpretation, multiple factors that can modify blood Glu should be kept in mind, apart from nutritional status mentioned earlier, age, gender [169], body temperature [170], and even blood sampling sites seem confounding factors [171].

Normal Glu in plasma and whole blood is 50–100 and 150–300 μmol/l, respectively [59]. In the whole brain, Glu concentration is 12 μmol/g [172]. The free amino acids concentration can be calculated using whole blood and plasma concentrations [173].

The inverse relationship between plasma Glu and nitrogen hemostasis implicates that plasma urea and ammonia nitrogen should be assessed as well.

It is worthwhile to measure more than one inflammatory marker (C-RP, TNF-α, IL6, IFN-γ, and IL-1β) to identify patients who are likely to respond to Glu-targeted therapies, since inflammation seems an incident predisposing to Glu excitotoxicity. This was corroborated when the elevated inflammatory markers in blood predicted the favorable antidepressant response to the noncompetitive NMDA antagonist, ketamine [174]. Also, the administration of the inflammatory cytokine and interferon (IFN)-α induced a high plasma TNF-α [175]. Moreover, the higher plasma CRP level in depressed patients was correlated to a higher brain Glu [176]. As implicated in neuropsychiatric disorders, IL-6 promotes hepatic acute phase proteins, while processing neuroinflammation in the brain [177].

No study tracking the patients' behavior to neuropsychiatric medications or dietary manipulations has targeted both the blood level of Glu and the inflammatory markers. So, elaborative research work is indispensable to elucidate the benefits of blood assays in prediction and management panels.

8. Conclusions

Glutamate is one of the key mediators involved in aggressive behavior. In neuropsychiatric disorders, blood or erythrocytic Glu level mirrored brain Glu fluctuations. Anemia was demonstrated to affect brain Glu level, meanwhile precipitating aggression. Lowering blood Glu increased Glu clearance from the brain. Dietary manipulation was successful in controlling aggression, as inflammation and oxidative stress have been implicated in altered brain Glu and aggression. Hence, blood or erythrocytic assay of Glu might help the diagnosis and prognosis of aggression, as well as planning corresponding therapeutic strategies ranging from simple dietary manipulation, up to complex pharmacologic treatments. The more advances in the scientific research, knowledge, and testing techniques, the more explicit will be the

dynamics of behavioral issues, the more feasible and successful will be the diagnostic, preventive, and therapeutic interventions. Nonetheless, Glu is not the only culprit in aggression, other explored neurotransmitters and inflammatory markers can be assayed and targeted as well, to obtain a panel of laboratory markers and plan several therapeutic alternatives using these mediators, hoping to prevent an outraged ideation from proceeding to a devastating aggression.

Acknowledgements

No acknowledgments.

Conflict of interest

The author declares no conflict of interest.

Thanks

I would like to thank prof. Dr. Salwa Abdelmoneim Elmessiry for her continued support, who guided me and taught me a lot about scientific research. My deep gratitude to her. Special thanks and appreciations to all my professors and colleagues at Medical Pharmacology Department, Faculty of Medicine, Kasr Al-Ainy, Cairo University, Egypt, for being supportive and encouraging.

Author details

Sherine Abdelmissih
Faculty of Medicine, Kasr Al-Ainy, Cairo University, Cairo, Egypt

*Address all correspondence to: drshery_wa@yahoo.com;
drshery_wa@kasralainy.edu.eg

References

[1] Felthous AR, Nassif J. CNS glutamate in impulsive aggression. In: Pavlovic ZM, editor. Glutamate and Neuropsychiatric Disorders. Current and Emerging Treatments. Cham: Springer International Publishing AG; 2022. pp. 283-312. DOI: 10.1007/978-3-030-87480-3

[2] Dallman MF, Pecoraro N, Akana SF, SEI F, Gomez F, Houshyar H, et al. Chronic stress and obesity: A new view of 'comfort food'. Proceedings of the National Academy of Sciences of the United States of America. 2003;**100**:11696-11701. DOI: 10.1073/pnas.1934666100

[3] American Psychological Association (APA) Dictionary of Psychology. Washington DC: American Psychological Association (APA); 2022

[4] Bushman BJ, Anderson CA. Is it time to pull the plug on the hostile versus instrumental aggression dichotomy? Psychological Review. 2001;**108**:273-279. DOI: 10.1037/0033-295X.108.1.273

[5] Archer JB, Coyne S. The relationship between indirect and physical aggression on television and in real life. Social Development. 2005;**14**:324-338. Faculty Publications. 2353 Available from: https://scholarsarchive.byu.edu/facpub/2353

[6] Olafsen RN, Viemero V. Bully/victim problems and coping with stress in school among 10- to 12-year old pupils in Aland, Finland. Aggressive Behavior. 2000;**26**(1):57-65. DOI: 10.1002(SICI)1098-2337(2000)26:1<57::AID-AB5>3.0.CO;2-I

[7] Hinduja S, Patchin JW. Bullying Beyond the Schoolyard: Preventing and Responding to Cyberbullying. Thousand Oaks, CA: Corwin Press; 2009 ISBN: 1483349934

[8] Barratt ES. Measuring and predicting aggression within the context of a personality theory. The Journal of Neuropsychiatry and Clinical Neurosciences. 1991;**3**(2):S35-S39 PMID: 1821220

[9] Felthous AR, Barratt ES. Impulsive versus premeditated aggression: Implications for mens rea decisions. Behavioral Sciences & the Law. 2003;**21**:619-630. DOI: 10.1002/bsl.555

[10] Huecker MR, King KC, Jordan JA, Smock W. Domestic violence. In: StatPearls [Internet]. Treasure Island, FL: StatPearls Publishing; 2022 PMID: 29763066

[11] Zhang Z, Zhai A, Yang M, Zhang J, Zhou H, Yang C, et al. Prevalence of depression and anxiety symptoms of high school students in Shandong Province during the COVID-19 epidemic. Frontiers in Psychiatry. 2020;**11**:570096. DOI: 10.3389/fpsyt.2020.570096

[12] Vindegaard N, Benros ME. COVID-19 pandemic and mental health consequences: Systematic review of the current evidence. Brain, Behavior, and Immunity. 2020;**89**:531-542. DOI: 10.1016/j.bbi.2020.05.048

[13] Usher K, Bhullar N, Darkin J, Gyamfi N, Jackson D. Family violence and COVID19: Increased vulnerability and reduced options for support. International Journal of Mental Health Nursing. 2020;**29**:549-552. DOI: 10.1111/inm.12735

[14] Sher L. The impact of the COVID-19 pandemic on suicide rates. QJM. 2020a;**113**(10):707-712. DOI: 10.1093/qjmed/hcaa202

[15] Ferrando SJ, Klepacz L, Lynch S, Tavakkoli M, Dornbush R, Baharani R, et al. COVID-19 psychosis: A potential new neuropsychiatric condition triggered by novel coronavirus infection and the inflammatory response? Psychosomatics. 2020;**61**(5):551-555. DOI: 10.1016/j.psym.2020.05.012

[16] DeLisi LE. A commentary revisiting the viral hypothesis of schizophrenia: Onset of a schizophreniform disorder subsequent to SARS CoV-2 infection. Psychiatry Research. 2021;**295**:113573. DOI: 10.1016/j.psychres.2020.113573

[17] Ariza-Varón M, Beltrán MA, Marín-Medina DS, González AF, Ávila AM. Psychosis associated with suspected SARS-CoV-2 encephalitis with response to steroids: A case report. Infectious Diseases (London). 2022;**54**(2):152-156. DOI: 10.1080/23744235.2021.19773812021 Aug 15;90(4):e23-e26

[18] McAlpine LS, Lifland B, Check JR, Angarita GA, Ngo TT, Pleasure SJ, et al. Remission of subacute psychosis in a COVID-19 patient with an antineuronal autoantibody after treatment with intravenous immunoglobulin. Biological Psychiatry. 2021;**90**(4):e23-e26. DOI: 10.1016/j.biopsych.2021.03.033

[19] Smith CM, Gilbert EB, Riordan PA, Helmke N, von Isenburg M, Kincaid BR, et al. COVID-19-associated psychosis: A systematic review of case reports. General Hospital Psychiatry. 2021;**73**:84-100. DOI: 10.1016/j.genhosppsych.2021.10.003

[20] Saylor KE, Amann BH. Impulsive aggression as a comorbidity of attention-deficit/hyperactivity disorder in children and adolescents. Journal of Child and Adolescent Psychopharmacology. 2016;**26**(1):19-25. DOI: 10.1089/cap.2015.0126

[21] Alniak Í, Erkıran M, Mutlu E. Substance use is a risk factor for violence behavior in male patients with bipolar disorder. Journal of Affective Disorders. 2016;**193**:89-93. DOI: 10.1016/j.jad.2015.12.059

[22] Soreff SM, Gupta V, Wadhwa R, Arif H. Aggression. In: StatPearls [Internet]. Treasure Island, FL: StatPearls Publishing; 2022 PMID: 28846310

[23] Kirwan M, Lanni DJ , Warnke A, Pickett SM, Parkhill MR. Emotion regulation moderates the relationship between alcohol consumption and the perpetration of sexual aggression. Violence Against Women. 2019;**25**(9):1053-1073. DOI: 10.1177/1077801218808396

[24] Bhutta ZA, Salam RA. Global nutritional epidemiology and trends. Annals of Nutrition & Metabolism. 2012;**61**(Suppl. 1):19-27. DOI: 10.1159/000345167

[25] Pol RR, Howard MR. A man with anemia and a change in personality. Blood Work. 2014;**123**(12):1784. DOI: 10.1182/blood-2013-12-544387

[26] Robinson SL, Marín C, Oliveros H, Mora-Plazas M, Richards BJ, Lozoff B, et al. Iron deficiency, anemia, and low vitamin B-12 serostatus in middle childhood are associated with behavior problems in adolescent boys: Results from the Bogotá school children cohort. Journal of Nutrition. 2018;**148**(5):760-770. DOI: 10.1093/jn/nxy029

[27] Su J, Cui N, Zhou G, Ai Y, Sun G, Zhao SR, et al. Hemoglobin status and externalizing behavioral problems in children. IJERPH. 2016;**13**(8):758. DOI: 10.3390/ijerph13080758

[28] Lozoff B. Early iron deficiency has brain and behavior effects consistent with dopaminergic

dysfunction. The Journal of Nutrition. 2011;**141**(4):740S-746S. DOI: 10.3945/jn.110.131169

[29] Bruno V, Mancini D, Ghoche R, Arshinoff R, Miyasaki JM. High prevalence of physical and sexual aggression to caregivers in advanced Parkinson's disease. Experience in the palliative care program. Parkinsonism & Related Disorders. 2016;**24**:141-142. DOI: 10.1016/j.parkreldis.2016.01.010

[30] Wise J. Antidepressants may double risk of suicide and aggression in children, study finds. BMJ. 2016;**28**(352):i545. DOI: 10.1136/bmj.i545

[31] Turner D, Basdekis-Jozsa R, Briken P. Prescription of testosterone-lowering medications for sex offender treatment in German forensic-psychiatric institutions. The Journal of Sexual Medicine. 2013;**10**(2):570-578. DOI: 10.1111/j.1743-6109.2012.02958.x

[32] Suñol A, Perez-Accino J, Kelley M, Rossi G, Schmitz SS. Successful dietary treatment of aggression and behavioral changes in a dog. Journal of Veterinary Behavior. 2020;**37**:56-60. DOI: 10.1016/j.jveb.2020.04.009

[33] de Almeida RMM, Ferrari PF, Parmigiani S, Miczek KA. Escalated aggressive behavior: Dopamine, serotonin, and GABA. European Journal of Pharmacology. 2005;**526**(1-3):51-64. DOI: 10.1016/j.ejphar.2005.10.004

[34] Narvaes R, de Almeida RM. Aggressive behavior and three neurotransmitters: Dopamine, GABA, and serotonin—A review of the last 10 years. Psychology & Neuroscience. 2014;**7**(4):601-607. DOI: 10.3922/j.psns.2014.4.20

[35] Nordman JC. Anger management: Mechanisms of glutamate recptor-mediated synaptic plasticity underlying animal aggression. The International Journal of Biochemistry & Cell Biology. 2022;**142**:106120. DOI: 10.1016/j.biocel.2021.106120

[36] Takahashi A, Miczek K. Neurogenetics of aggressive behavior: Studies in rodents. Current Topis in Behavioral Neurosciences. 2014;**17**:3-44. DOI: 10.1007/7854_2013_263

[37] Kew JN, Trube G, Kemp JA. State-dependent NMDA receptor antagonism by Ro 8-4304, a novel NR2B selective, non-competitive, voltage-independent antagonist. British Journal of Pharmacology. 1998;**123**(3):463-472 PubMed ID: 9504387

[38] Ma TM, Paul BD, Fu C, Hu S, Zhu H, Blackshaw S, et al. Serine racemase regulated by binding to stargazin and PSD-95: Potential N-methyl-D-aspartate-alpha-amino-3-hydroxy-5-methyl-4-isoxazolepropionic acid (NMDA-AMPA) glutamate neurotransmission cross-talk. The Journal of Biological Chemistry. 2014;**289**:29631-29641. DOI: 10.1074/jbc.M114.571604

[39] Torres-Platas SG, Hercher C, Davoli MA, Maussion G, Labonte B, Turecki G, et al. Astrocytic hypertrophy in anterior cingulate white matter of depressed suicides. Neuropsychopharmacology. 2011;**36**(13):2650-2658. DOI: 10.1038/npp.2011.154

[40] Liddelow S, Barres B. SnapShot: Astrocytes in health and disease. Cell. 2015;**162**(5):1170-1170.e1. DOI: 10.1016/j.cell.2015.08.029

[41] Yang L, Wang M, Guo YY, Sun T, Li YJ, Wang Q, et al. Systemic inflammation induces anxiety disorder through CXCL12/CXCR4 pathway. Brain, Behavior, and Immunity. 2016;**56**:352-362. DOI: 10.1016/j.bbi.2016.03.001

[42] Santello M, Volterra A. TNFalpha in synaptic function: Switching gears. Trends in Neurosciences. 2012;**35**:638-647. DOI: 10.1016/j.tins.2012.06.001

[43] Haroon E, Miller AH, Sanacora G. Inflammation, glutamate, and glia: A trio of trouble in mood disorders. Neuropsychopharmacology Reviews. 2017;**42**:193-215. DOI: 10.1038/npp.2016.199

[44] Kielian T, Esen N. Effects of neuroinflammation on glia-glia gap junctional intercellular communication: A perspective. Neurochemistry International. 2004;**45**:429-436. DOI: 10.1016/j.neuint.2003.09.010

[45] Volterra A, Meldolesi J. Astrocytes, from brain glue to communication elements: The revolution continues. Nature Reviews. Neuroscience. 2005;**6**:626-640. DOI: 10.1038/nrn1722

[46] Parri HR, Gould TM, Crunelli V. Spontaneous oscillations astrocytic Ca^{2+} in situ drive NMDAR-mediated neuronal excitation. Nature Neuroscience. 2001;**4**:803-812. DOI: 10.1038/90507

[47] Sofroniew MV, Hinters HV. Astrocytes: Biology and pathology. Acta Neuropathologica. 2010;**119**:7-35. DOI: 10.1007/s00401-009-0619-8

[48] Louveau A, Smirnov I, Keyes TJ, Eccles JD, Rouhani SJ, Peske JD, et al. Structural and functional features of central nervous system lymphatic vessels. Nature. 2015;**523**:337-341. DOI: 10.1038/nature14432

[49] Dorsett CR, McGuire JL, DePasquale EA, Gardner AE, Floyd CL, McCullumsmith RE. Glutamate neurotransmission in rodent models of traumatic brain injury. Journal of Neurotrauma. 2017;**34**(2):263-272. DOI: 10.1089/neu.2015.4373

[50] Albrecht J, Zielinska M, Norenberg MD. Glutamine as a mediator of ammonia neurotoxicity: A critical appraisal. Biochemical Pharmacology. 2010;**80**:1303-1308. DOI: 10.1016/j.bcp.2010.07.024

[51] Zhou Y, Danbolt NC. Glutamate as a neurotransmitter in the healthy brain. Journal of Neural Transmission. 2014;**121**:799-817. DOI: 10.1007/s00702-014-1180-8

[52] Shan D, Lucas EK, Drummond JB, Haroutunian V, Meador-Woodruff JH, McCullumsmith RE. Abnormal expression of glutamate transporters in temporal lobe areas in elderly patients with schizophrenia. Schizophrenia Research. 2013;**144**:1-8. DOI: 10.1016/j.schres.2012.12.019

[53] Zou JY, Crews FT. TNF alpha potentiates glutamate neurotoxicity by inhibiting glutamate uptake in organotypic brain slice cultures: Neuroprotection by NF kappa B inhibition. Brain Research. 2005;**1034**:11-24. DOI: 10.1016/j.brainres.2004.11.014

[54] Nakagawa T, Otsubo Y, Yatani Y, Shirakawa H, Kaneko S. Mechanisms of substrate transport-induced clustering of a glial glutamate transporter GLT-1 in astroglial-neuronal cultures. The European Journal of Neuroscience. 2008;**28**:1719-1730. DOI: 10.1111/j.1460-9568.2008.06494.x

[55] Takahashi K, Foster JB, Lin CL. Glutamate transporter EAAT2: Regulation, function, and potential as a therapeutic target for neurological and psychiatric disease. Cellular and Molecular Life Sciences. 2015;**72**:3489-3506 ISSN: 1420-682X

[56] Wang F, Smith NA, Xu Q, Goldman S, Peng W, Huang JH, et al. Photolysis of caged Ca^{2+} but not

receptor—mediated Ca^{2+} signaling triggers astrocytic glutamate release. The Journal of Neuroscience. 2013;**33**:17404-17412. DOI: 10.1523/JNEUROSCI.2178-13.2013

[57] Vercellino M, Mirola A, Piacentino C, Votta B, Capello E, Mancardi GL, et al. Altered glutamate reuptake in relapsing-remitting and secondary progressive multiple sclerosis cortex: Correlation with microglia infiltration, demyelination, and neuronal and synaptic damage. Journal of Neuropathology and Experimental Neurology. 2007;**66**:732-739. DOI: 10.1097/nen.0b013e31812571b0

[58] Dantzer R, Walker AK. Is there a role for glutamate-mediated excitotoxicity in inflammation-induced depression? Journal of Neural Transmission. 2014;**121**:925-932. DOI: 10.1007/s00702-014-1187-1

[59] Leibowitz A, Boyko M, Shapira Y, Zlotnik A. Blood glutamate scavenging: Insight into neuroprotection. International Journal of Molecular Sciences. 2012;**13**:10041-10066. DOI: 10.3390/ijms130810041

[60] Nagy C, Suderman M, Yang J, Szyf M, Mechawar N, Ernest C, et al. Astrocytic abnormalities and global DNA methylation patterns in depression and suicide. Molecular Psychiatry. 2015;**20**:320-328. DOI: 10.1038/mp.2014.21

[61] Giovanoli S, Weber-Satdlbauer U, Schedlowski M, Meyer U, Engler H. Prenatal immune activation causes hippocampal synaptic deficits in the absence of overt microglia anomalies. Brain, Behavior, and Immunity. 2016;**55**:25-38. DOI: 10.1016/j.bbi.2015.09.015

[62] Birey F, Kloc M, Chavali M, Hussein I, Wilson M, Christoffel DJ, et al. Genetic and stress-induced loss of NG2 glia triggers emergence of depressive-like Behaviors through reduced secretion of FGF2. Neuron. 2015;**88**(5):941-956. DOI: 10.1016/j.neuron.2015.10.046

[63] Dimou L, Gallo V. NG2-glia and their functions in the central nervous system. Glia. 2015;**63**(8):1429-1451. DOI: 10.1002/glia.22859

[64] Steffek AE, McCullumsmith RE, Haroutunian V, Meador-Woodruff JH. Cortical expression of glial fibrillary acidic protein and glutamine synthetase is decreased in schizophrenia. Schizophrenia Research. 2008;**103**:71-82. DOI: 10.1016/j.schres.2008.04.032

[65] Kerrigan JF, Parsons A, Tsang C, Simeone K, Coon S, Wu J. Hypothalamic hamartoma: Neuropathology and epileptogenesis. Epilepsia. 2017;**58**(52):22-31. DOI: 10.1111/epi.13752

[66] Huband N, Ferriter M, Nathan R, Jones H. Antiepileptics for aggression and associated impulsivity. Cochrane Database of Systematic Reviews. 2010;(2):CD003499. DOI: 10.1002/14651858.CD003499.pub3

[67] Haller J. The neurobiology of abnormal manifestations of aggression—A review of hypothalamic mechanisms in cats, rodents, and humans. Brain Research Bulletin. 2013;**93**:97-109. DOI: 10.1016/j.brainresbull.2012.10.003

[68] Siegel A, Bhatt S, Bhatt R, Zalcman SS. The neurobiological bases for development of pharmacological treatments of aggressive disorders. Current Neuropharmacology. 2007;**5**:135-147. DOI: 10.2174/157015907780866929

[69] Carrillo M, Ricci LA, Melloni RH. Glutamate and the aggression neural circuit in adolescent anabolic

steroid-treated Syrian hamsters (*Mesocricetus auratus*). Behavioral Neuroscience. 2011;**125**:753-763. DOI: 10.1037/a0025127

[70] Brodkin ES, Goforth SA, Keene AH, Fossella JA, Silver LM. Identification of quantitative trait loci that affect aggressive behavior in mice. The Journal of Neuroscience. 2002;**22**(3):1165-1170. DOI: 10.1523/jneurosci.22-03-01165.2002

[71] Zhao X, Sun L, Jia H, Meng Q, Wu S, Li N, et al. Isolation rearing induces social and emotional function abnormalities and alters glutamate and neurodevelopment-related gene expression in rats. Progress in Neuro-Psychopharmacology and Biological Psychiatry. 2009;**33**:1173-1177. DOI: 10.1016/j.pnpbp.2009.06.016

[72] Niihara Y, Zerez C, Akiyama D, Tanaka K. Increased red cell glutamine availability in sickle cell anemia: Demonstration of increased active transport, affinity, and increased glutamate level in intact red cells. The Journal of Laboratory and Clinical Medicine. 1997;**130**:83-90. DOI: 10.1016/s0022-2143(97)90062-7

[73] Ellinger JJ, Lewis IA, Markley JL. Role of aminotransferases in glutamate metabolism of human erythrocytes. Journal of Biomolecular NMR. 2011;**49**:221-229. DOI: 10.1007/s10858-0119481-9

[74] Whillier S, Garcia B, Chapman BE, Kuchel PW, Raftos JE. Glutamine and α-ketoglutarate as glutamate sources for glutathione synthesis in human erythrocytes. FEBS Journal. 2011:**278**(17):3152-3163. DOI: 10.1111/j.1742-4658.2011.08241.x

[75] Reverte L, Yeregui E, Olona M, Gutierrez-Valencia A, Buzon MJ, Marti A, et al. Fetuin-A, inter-alpha-trypsin inhibitor, glutamic acid and ChoE (18:0) are key biomarkers in a panel distinguishing mild from critical coronavirus disease 2019 outcomes. Clinical and Translational Medicine. 2022;**12**(1):e704. DOI: 10.1002/ctm2.704

[76] Jovic Z, Veselinovic M, Vasic K, Stankovic-Djordjevic D, Cekic S, Milovanovic M, et al. Monosodium glutamate induces apoptosis in naive and memory human B cells. Bratislavské Lekárske Listy. 2009;**110**(10):636-640 Accession Number: 20017456

[77] Mokrushin AA, Pavlinova LI. Effects of the blood components on the AMPA and NMDA synaptic responses in brain slices in the onset of hemorrhagic stroke. General Physiology and Biophysics. 2013;**32**(4):489-504. DOI: 10.4149/gpb_2013038

[78] Meldrum BS. Glutamate as a neurotransmitter in the brain: Review of physiology and pathology. Journal of Nutrition. 2000;**130**:1007S-1015S. DOI: 10.1093/jn/130.4.1007S

[79] Liu J, Ma W, Zang CH, Wang GD, Zhang SJ, Wu HJ, et al. Salidroside inhibits NLRP3 inflammasome activation and apoptosis in microglia induced by cerebral ischemia/reperfusion injury by inhibiting the TLR4/NF-kappaB signaling pathway. Annals of Translational Medicine. 2021;**9**(22):1694. DOI: 10.21037/atm-21-5752

[80] Abbott NJ, Patabendige AAK, Dolman DEM, Yousof SR, Begley DJ. Structure and function of the blood-brain barrier. Neurobiology of Disease. 2010;**37**(1):13-25. DOI: 10.1016/j.nbd.2009.07.030

[81] Hashimoto K, Engberg G, Shimizu E, Nordin C, Lindström LH, Iyo M. Elevated glutamine/glutamate

ratio in cerebrospinal fluid of first episode and drug naïve schizophrenic patients. BMC Psychiatry. 2005;**5**:6. DOI: 10.1186/1471-244X-5-6

[82] Hassan TH, Abdelrahman HM, Abdel Fattah NR, El-Masry NM, Hashim HM, El-Gerby KM, et al. Blood and brain glutamate levels in children with autistic disorder. Research in Autism Spectrum Disorder. 2013;**7**:541-548. DOI: 10.1016/j.rasd.2012.12.005

[83] Madeira C, Alheira FV, Calcia MA, Silva TCS, Tannos FM, Vargas-Lopes C, et al. Blood levels of glutamate and glutamine in recent onset and chronic schizophrenia. Frontiers in Psychiatry. 2018;**9**:713. DOI: 10.3389/psyt.2018.00713

[84] Palomino A, González-Pinto A, Aldama A, González-Gómez C, Mosquera F, González-García G, et al. Decreased levels of plasma glutamate in patients with first-episode schizophrenia and bipolar disorder. Schizophrenia Research. 2007;**95**:174-178. DOI: 10.1016/j.schres.2007.06.012

[85] Ivanova SA, Boyko AS, Fedorenko OY, Krotenko NM, Semke AV, Bokhan NA. Glutamate concentration in the serum of patients with schizophrenia. Procedia Chemistry. 2014;**10**:80-85. DOI: 10. 1016/j.proche.2014.10.015

[86] Blouin M, Tremblay A, Jalbert ME, Jenables H, Bouchard RH, Roy MA, et al. Adiposity and eating behaviors in patients under second generation antipsychotics. Obesity. 2008;**2008**(16):1780-1787. DOI: 10.1038/oby.2008.277

[87] Bushe C, Haddad P, Peveler R, Pendlebury J. The role of lifestyle interventions and weight management in schizophrenia. Journal of Psychopharmacology. 2005;**19**:28-35. DOI: 10.1177/0269881105058682

[88] Geha RS, Beiser A, Ren C, Patterson R, Greenberger PA, Grammar LC, et al. Review of alleged reaction to monosodium glutamate and outcome of a multicenter double-blind placebo-controlled study. The Journal of Nutrition. 2000;**130**(4S Suppl):1058S-1062S. DOI: 10.1093/jn/130.4.1058S

[89] Husarova V, Ostatnikov D. Monosodium glutamate toxic effects and their implications for human intake: A review. JMED Research. 2013;**2013**(2013), Article ID: 608765. DOI: 10.5171/2013.608765

[90] Samuels A. The toxicity/safety of processed free glutamic acid (MSG): A study in suppression of information. Accountability in Research. 1999;**6**(4):259-310. DOI: 10.1080/08989629908573933

[91] Farombi O, Onyema OO. Monosodium glutamate-induced oxidative damage and genotoxicity in the rat: Modulatory role of vitamin C, vitamin E and quercetin. Human & Experimental Toxicology. 2006;**25**(5):251-259. DOI: 10.1191/0960327106ht621oa

[92] Tawfik MS, Al-Badr N. Adverse effects of monosodium glutamate on liver and kidney functions in adult rats and potential protective effect of vitamins C and E. Food and Nutrition Sciences. 2012;**3**:651-659. DOI: 10.4236/fns.201235089

[93] Khalil RM, Khedr NF. Curcumin protects against monosodium glutamate neurotoxicity and decreasing NMDA2B and mGluR5 expression in rat hippocampus. Neurosignals. 2016;**24**(1):81-87. DOI: 10.1159/000442614

[94] Abu-Taweel GM, Zyadah MA, Ajarem JS, Ahmad M. Cognitive and

biochemical effects of monosodium glutamate and aspartame, administered individually and in combination in male albino mice. Neurotoxicology and Teratology. 2014;**42**:60-67. DOI: 10.1016/j.ntt.2014.02.001

[95] Quines CB, Rosa SG, Da Rocha JT, Gai BM, Bortolatto CF, Duarte MMMF, et al. Monosodium glutamate, a food additive, induces depressive-like and anxiogenic-like behaviors in young rats. Life Sciences. 2014;**107**(1-2):27-31. DOI: 10.1016/j.lfs.2014.04.032

[96] Rivera-Cervantes MC, Castaneda-Arellano R, Castro-Torres RD, Gudino-Cabrera G, Feria Y Velasco AI, Camins A, et al. P38 MAPK inhibition protects against glutamate neurotoxicity and modifies NMDA and AMPA receptor subunit expression. Journal of Molecular Neuroscience. 2014;**55**(3):596-608. DOI: 10.1007/s12031-014-0398-0

[97] Sadek K, Abouzed T, Nasr S. Lycopene modulates cholinergic dysfunction, Bcl-2/Bax balance, and antioxidant enzymes gene transcripts in monosodium glutamate (E621) induced neurotoxicity in a rat model. Canadian Journal of Physiology and Pharmacology. 2016;**94**(4):394-401. DOI: 10.1139/cjpp-2015-0388

[98] Shivasharan BD, Nagakannan P, Thippeswamy BS, Veerapur VP. Protective effect of *Calendula officinalis* L. flowers against monosodium glutamate induced oxidative stress and excitotoxic brain damage in rats. Indian Journal of Biochemistry & Biophysics. 2014;**28**(3):292-298. DOI: 10.1007/s12291-012-0256-1 256

[99] Swamy AH, Patel NL, Gadad PC, Koti BC, Patel UM, Thippeswamy AH, et al. Neuroprotective activity of *Pongamia pinnata* in monosodium glutamate-induced neurotoxicity in rats. Indian Journal of Pharmaceutical Sciences. 2014;**75**(6):657-663 PMID: 24591740

[100] Zanfirescu A, Ungurianu A, Tsatsakis AM, Nițulescu GM, Kouretas D, Veskoukis A, et al. A review of the alleged health hazards of monosodium glutamate. Comprehensive Reviews in Food Science and Food Safety. 2019;**18**(4):1111-1134. DOI: 10.1111/1541-4337.12448

[101] Shi Z, Yuan B, Wittert GA, Pan X, Dai Y, Adams R, et al. Monosodium glutamate intake, dietary patterns and asthma in Chinese adults. PLoS One. 2012;**7**(12):e51567. DOI: 10.1371/journal.pone.0051567

[102] Hriscu M, Saulea G, Vidrascu N, Baciu I. Effects of monosodium glutamate on blood neutrophils phagocytic activity and phagocytic response in mice. Romanian Journal of Physiology. 1997;**34**(1-4):95-101

[103] Sharma A. Monosodium glutamate-induced oxidative kidney damage and possible mechanisms: A mini-review. Journal of Biomedical Science. 2015;**22**:93. DOI: 10.1186/s12929-015-0192-5

[104] Harris WS. The omega-6/omega-3 ratio and cardiovascular disease risk: Uses and abuses. Current Atherosclerosis Reports. 2006;**8**:453-459. DOI: 10.1007/s11883-006-0019-7

[105] Yamashima T, Ota T, Mizukoshi E, Nakamura H, Yamamoto Y, Kikuchi M, et al. Intake of ω-6 polyunsaturated fatty acid-rich vegetable oils and risk of lifestyle diseases. Advances in Nutrition. 2020;**11**(6):1489-1509. DOI: 10.1093/advances/nmaa072

[106] Harris WS, Mozaffarian D, Rimm E, Kris-Etherton P, Rudel LL,

Appel LJ, et al. Omega-6 fatty acids and risk for cardiovascular disease: A science advisory from the American Heart Association nutrition subcommittee of the council on nutrition, physical activity, and metabolism; council on cardiovascular nursing; and council on epidemiology and prevention. Circulation. 2009;**119**(6):902-907. DOI: 10.1161/CIRCULATIONAHA.108.191627

[107] Food and Nutrition Board, Institute of Medicine. Dietary Reference Intake for Energy, Carbohydrate, Fiber, Fat, Fatty Acids, Cholesterol, Protein and Amino Acid (Micronutrients). National Academy of Sciences, Washington DC; 2002

[108] Parker G, Gibson NA, Brotchie H, Heruc G, Rees AM, Hadzi-Pavlovic D. Omega-3 fatty acids and mood disorders. The American Journal of Psychiatry. 2006;**163**(6):969-978. DOI: 10.1176/ajp.2006.163.6.969

[109] Dyall SC. Long-chain omega-3 fatty acids and the brain: A review of the independent and shared effects of EPA, DPA and DHA. Frontiers in Aging Neuroscience. 2015;**7**:52. DOI: doi.org/10.3389/fnagi.2015.00052

[110] Kaur G et al. Docosapentaenoic acid (22:5n-3): A review of its biological effects. Progress in Lipid Research. 2011;**50**:28-34. DOI: 10.1016/j.plipres.2010.07.004

[111] De Caterina R. n-3 fatty acids in cardiovascular disease. The New England Journal of Medicine. 2011;**364**(25):2439-2450. DOI: 10.1056/NEJMra1008153

[112] Hussein N, Ah-Sing E, Wilkinson P, Leach C, Griffin BA, Millward DJ. Long-chain conversion of [13C]linoleic acid and alpha-linolenic acid in response to marked changes in their dietary intake in men. Journal of Lipid Research. 2005;**46**(2):269-280. DOI: 10.1194/jlr.M400225-JLR200

[113] Kalmijn S, van Boxtel MPJ, Ocké M, Verschuren WMM, Kromhout D, Launer LJ. Dietary intake of fatty acids and fish in relation to cognitive performance at middle age. Neurology. 2004;**62**(2):275-280. DOI: 10.1212/01.wnl.0000103860.75218.a5

[114] Brenna JT, Diau G-Y. The influence of dietary docosahexaenoic acid and arachidonic acid on central nervous system polyunsaturated fatty acid composition. Prostaglandins, Leukotrienes, and Essential Fatty Acids. 2007;**77**(5-6):247-250. DOI: 10.1016/j.plefa.2007.10.016

[115] Rapaport SI, Rao JS, Igarashi M. Brain metabolism of nutritionally essential polyunsaturated fatty acids depends on both the diet and the liver. Prostaglandins, Leukotrienes and Essential Fatty Acids. 2007;**77**:251-261. DOI: 10.1016/j.plefa.2007.10.023

[116] Aryal S, Hussain S, Drevon CA, Nagelhus E, Hvalby Ø, Jensen V, et al. Omega-3 fatty acids regulate plasticity in distinct hippocampal glutamatergic synapses. The European Journal of Neuroscience. 2019;**49**:40-50. DOI: 10.111/ejn.14224

[117] Yamashima T. Dual effects of the non-esterified fatty acid receptor 'GPR40' for human health. Progress in Lipid Research. 2015;**58**:40-50. DOI: 10.1016/j.plipres.2015.01.002

[118] Neugebauer R, Hoek HW, Susser E. Prenatal exposure to wartime famine and development of antisocial personality disorder in early adulthood. JAMA. 1999;**282**(5):455-462. DOI: 10.1001/jama.282.5.455

[119] Liu J, Raine A, Venables PH, Mednick SA. Malnutrition at age 3 years and externalizing behavior problems at ages 8, 11, and 17 years. American Journal of Psychiatry. 2004;**161**(11):2005-2013. DOI: 10.1176/appi.ajp.161.11.2005

[120] Moreira JD, Knorr L, Ganzella M, Thomazi AP, de Souza CG, de Souza DG, et al. Omega-3 fatty acids deprivation affects ontogeny of glutamatergic synapses in rats: Relevance for behavior alterations. Neurochemistry International. 2010;**56**(6-7):753-759. DOI: 10.1016/j.neuint.2010.02.010

[121] Hibbeln JR. Seafood consumption and homicide mortality. A cross-national ecological analysis. World Review of Nutrition and Dietetics. 2001;**88**:41-46. DOI: 10.1159/000059747

[122] Iribarren C, Markovitz JH, Jacobs DR Jr, Schreiner PJ, Davilgus M, Hibbeln JR. Dietary intake of n-3, n-6 fatty acids and fish: Relationship with hostility in young adults—The CARDIA study. European Journal of Clinical Nutrition. 2004;**58**:24-31. DOI: 10.1038/sj.ejcn.1601739

[123] Hibbeln JR, Davis JM, Steer C, Emmett P, Rogers R, Williams C, et al. Maternal seafood consumption in pregnancy and neurodevelopmental outcomes in childhood (ALSPAC study): An observational cohort study. Lancet. 2007;**17**(369):578-585. DOI: 10.1016/S0140-6736(07)60277-3

[124] Zaalberg A, Nijman H, Bulten E, Stroosma L, van der Staak C. Effects of nutritional supplements on aggression, rule-breaking, and psychopathology among young adult prisoners. Aggressive Behavior. 2010;**36**(2):117-126. DOI: 10.1002/ab.20335

[125] Long S-J, Benton D. Effects of vitamin and mineral supplementation on stress, mild psychiatric symptoms, and mood in nonclinical samples: A meta-analysis. Psychosomatic Medicine. 2013;**75**(2):144-153. DOI: 10.1097/PSY.0b013e31827d5fbd

[126] Raine A, Portnoy J, Liu J, Mahoomed T, Hibbeln J. Reduction in behavior problems with omega-3 supplementation in children aged 8-16 years: A randomized, double-blind, placebo-controlled, stratified, parallel-group trial. Journal of Child Psychology and Psychiatry. 2015;**56**(5):509-520. DOI: 10.1111/j.jcpp.12314

[127] Bègue L, Zaalberg A, Shankland R, Duke A, Jacquet J, Kaliman P, et al. Omega-3 supplements reduce self-reported physical aggression in healthy adults. Psychiatry Research. 2018;**261**:307-311. DOI: 10.1016/j.psychres.2017.12.038

[128] Wohleb ES, Franklin T, Iwata M, Duman RS. Integrating neuroimmune systems in the neurobiology of depression. Nature Reviews. Neuroscience. 2016;**17**(8):497-511. DOI: 10.1038/nrn.2016.69

[129] Santello M, Volterra A. TNFα in synaptic function: Switching gears. Trends in Neurosciences. 2012;**35**:638-647. DOI: 10.1016/j.tins.2012.06.001

[130] Iwata M, Ota KT, Li X-Y, Sakaue F, Li N, Dutheil S, et al. Psychological stress activates the inflammasome via release of adenosine triphosphate and stimulation of the purinergic type 2X7 receptor. Biological Psychiatry. 2016;**80**(1):12-22. DOI: 10.1016/j.biopsych.2015.11.026

[131] Kipnis J, Gadani S, Derecki NC. Pro-cognitive properties of T cells. Nature Reviews. Immunology. 2012;**12**(9):663-669. DOI: 10.1038/nri3280

[132] Arisi GM. Nervous and immune systems signals and connections:

Cytokines in hippocampus physiology and pathology. Epilepsy & Behavior. 2014;**38**:43-47. DOI: 10.1016/j.yebeh.2014.01.017

[133] Coccaro EF, Lee R, Fanning JR, Fuchs D, Goiny M, Erhardt S, et al. Tryptophan, kynurenine, and kynurenine metabolites: Relationship to lifetime aggression and inflammatory markers in human subjects. Psychoneuroendocrinology. 2016;**71**:189-196. DOI: 10.1016/j.psyneuen.2016.04.02

[134] Gorlova A, Pavlov D, Anthony DC, Ponomarev ED, Sambon M, Proshin A, et al. Thiamine and benfotiamine counteract ultrasound-induced aggression, normalize AMPA receptor expression and plasticity markers, and reduce oxidative stress in mice. Neuropharmacology. 2019;**156**:107543. DOI: 10.1016/j.neuropharm.2019.02.025

[135] Mentesana L, Adreani NM. Is aggression costly? Acute aggressive behavior perturbates the oxidative status of a wild bird independently of testosterone and progesterone. Hormones and Behavior. 2021:**128**:104913. 10.1016/j.yhbeh.2020.104913

[136] Whelan J. (n-6) and (n-3) polyunsaturated fatty acids and the aging brain: Food for thought. The Journal of Nutrition. 2008;**138**(12):2521-2522. DOI: 10.3945/jn.108.095943

[137] Brown AJ, Pang E, Roberts DC. Erythrocyte eicosapentaenoic acid versus docosahexaenoic acid as a marker for fish and fish oil consumption. Prostaglandins, Leukotrienes, and Essential Fatty Acids. 1991;**44**(2):103-106. DOI: 10.1016/0952-3278(91)90191-7

[138] Chouinard-Watkins R, Plourde M. Fatty acid metabolism in carriers of apolipoprotein E epsilon 4 allele: Is it contributing to higher risk of cognitive decline and coronary heart disease? Nutrients. 2014;**6**(10):4452-4471. DOI: 10.3390/nu6104452

[139] Metherel AH, Armstrong JM, Patterson AC, Stark KD. Assessment of blood measures of n-3 polyunsaturated fatty acids with acute fish oil supplementation and washout in men and women. Prostaglandins, Leukotrienes and Essential Fatty Acids. 2009;**81**(1):23-29. DOI: 10.1016/j.plefa.2009.05.018

[140] Nording ML, Yang J, Georgi K, Karbowski CH, German JB, Weiss RH, et al. Individual variation in lipidomic profiles of healthy subjects in response to omega-3 fatty acids. PLoS One. 2013;**8**(10):e76575. DOI: 10.1371/journal.pone.0076575

[141] Brenna JT, Salem N Jr, Sinclair AJ, Cunnane SC. Alpha-linolenic acid supplementation and conversion to n-3 long-chain polyunsaturated fatty acids in humans. International Society for the Study of Fatty Acids and Lipids, ISSFAL. Prostaglandins, Leukotrienes, and Essential Fatty Acids. 2009;**80**(2-3):85-91

[142] Virkkunen M, Nuutila A, Goodwin FK, Linnoila M. Cerebrospinal fluid monoamine metabolite levels in male arsonists. Archives of General Psychiatry. 1987;**44**(3):241-247. DOI: 10.1001/archpsyc.1987.01800150053007

[143] Meyer BJ, Byrne MK, Collier C, Parletta N, Crawford D, Winberg PC, et al. Baseline omega-3 index correlates with aggressive and attention deficit disorder behaviours in adult prisoners. PLoS One. 2015;**10**(3):e0120220. DOI: 10.1371/journal.pone.0120220

[144] Cortie CH, Byrne MK, Collier C, Parletta N, Crawford D, Winberg PC, et al. The effect of dietary supplementation

on aggressive behaviour in Australian adult male prisoners: A feasibility and pilot study for a randomised, double blind placebo controlled trial. Nutrients. 2020;**12**(9):2617èè. DOI: 10.3390/nu12092617

[145] Swierk M, Williams PG, Wilcox J, Russell KG, Meyer BJ. Validation of an Australian electronic food frequency questionnaire to measure polyunsaturated fatty acid intake. Nutrition. 2011;**27**(6):641-646. DOI: 10.1016/j.nut.2010.06.011

[146] Harris WS, Von Schacky C. The omega-3 index: A new risk factor for death from coronary heart disease? Preventive Medicine. 2004;**39**(1):212-220. DOI: 10.1016/j.ypmed.2004.02.030

[147] Walker RE, Jackson KH, Tintle NL, Shearer GC, Bernasconi A, Masson S, et al. Predicting the effects of supplemental EPA and DHA on the omega-3 index. The American Journal of Clinical Nutrition. 2019;**110**(4):1034-1040. DOI: 10.1093/ajcn/nqz161

[148] Garda HA, Bernasconi AM, Brenner RR. Possible compensation of structural and viscotropic properties in hepatic microsomes and erythrocyte membranes of rats with essential fatty acid deficiency. Journal of Lipid Research. 1994;**35**(8):1367-1377 Accession Number: 7989861

[149] Pascut D, Pratama MY, Vo NVT, Masadah R, Tiribelli C. The crosstalk between tumor cells and the microenvironment in hepatocellular carcinoma: The role of exosomal microRNAs and their clinical implications. Cancers (Basel). 2020;**12**(4). DOI: 10.3390/cancers12040823

[150] Salvador AF, de Lima KA, Kipnis J. Neuromodulation by the immune system: A focus on cytokines. Nature Reviews. Immunology. 2021;**21**(8):526-541. DOI: 10.1038/s41577-021-00508-z

[151] Koren T, Yifa R, Amer M, Krot M, Boshnak N, Ben-Shaanan TL, et al. Insular cortex neurons encode and retrieve specific immune responses. Cell. 2021;**184**(25):6211. DOI: 10.1016/j.cell.2021.11.021

[152] Klin Y, Zlotnik A, Boyko M, Ohayon S, Shapira Y, Teichberg VI. Distribution of radiolabeled l-glutamate and d-aspartate from blood into peripheral tissues in naive rats: Significance for brain neuroprotection. Biochemical and Biophysical Research Communications. 2010;**399**(4):694-698. DOI: 10.1016/j.bbrc.2010.07.144

[153] Smith QR. Transport of glutamate and other amino acids at the blood-brain barrier. The Journal of Nutrition. 2000;**130**(4S):1016S-1022S. DOI: 10.1093/jn/130.4.1016S

[154] Mayhan WG, Didion SP. Effect of chronic alcohol consumption on responses of cerebral arterioles. Alcoholism Clinical and Experimental Research. 1996;**20**(3):538-542. DOI: 10.1111/j.1530-0277.1996.tb01089.x

[155] Bai W, Zhou Y-G. Homeostasis of the intraparenchymal-blood glutamate concentration gradient: Maintenance, imbalance, and regulation. Frontiers in Molecular Neuroscience. 2017;**10**:400. DOI: 10.3389/fnmol.2017.00400

[156] Profaci CP, Munji RN, Pulido RS, Daneman R. The blood-brain barrier in health and disease: Important unanswered questions. The Journal of Experimental Medicine. 2020;**217**(4). DOI: 10.1084/jem.20190062

[157] Al-Sarraf H, Philip L. Effect of hypertension on the integrity of blood

brain and blood CSF barriers, cerebral blood flow and CSF secretion in the rat. Brain Research. 2003;**975**:179-188. DOI: 10.1016/S0006-8993(03)02632-5

[158] Ruban A, Berkutzki T, Cooper I, Mohar B, Teichberg VI. Invest blood glutamate scavengers prolong the survival of rats and mice with brain-implanted gliomas. New Drugs. 2012;**30**(6):2226-2235. DOI: 10.1007/s10637-012-9799-5

[159] Gruenbaum BF, Zlotnik A, Frenkel A, Fleidervish I, Boyko M. Glutamate efflux across the blood-brain barrier: New perspectives on the relationship between depression and the glutamatergic system. Metabolites. 2022;**12**(459):1-15. DOI: 10.3390/metabo12050459

[160] Sugahara H. Physiological rationale of aggressive behavior: A brain blood perfusion hypothesis. Medical Hypotheses. 2001;**57**(6):745-749. DOI: 10.1054/mehy.2001.1479

[161] Kealy J, Greene C, Campbell M. Blood-brain barrier regulation in psychiatric disorders. Neuroscience Letters. 2020;**726**:133664. DOI: 10.1016/j.neulet.2018.06.033

[162] Tully L, Humiston J, Cash A. Oxaloacetate reduces emotional symptoms in premenstrual syndrome (PMS): results of a placebo-controlled, cross-over clinical trial. Obstetrics & Gynecology Science. 2020;**63**(2):195-204. DOI: 10.5468/ogs.2020.63.2.195

[163] Lipton A, Singel DJ, Stamler JS. Neuroprotective and neurodestructive effects of nitric oxide and redox congeners. Annals of the New York Academy of Sciences. 1994;**738**:382-387. DOI: 10.1111/j.1749-6632.1994.tb21826.x

[164] Szatkowski M, Barbour B, Attwell D. Non-vesicular release of glutamate from glial cells by reversed electrogenic glutamate uptake. Nature. 1990;**348**(6300):443-446. DOI: 10.1038/348443a0

[165] D'Eufemia P, Finocciaro R, Lendvai D, Celli M, Viozzi L, Troiani P, et al. Erythrocyte and plasma levels of glutamate and aspartate in children affected by migraine. Cephalalgia. 1997;**6**:652-657. DOI: 10.1046/j.1468-2982.1997.1706652.x

[166] Cananzi AR, D'Andrea G, Perini F, Zamberlan F, Welch KM. Platelet and plasma levels of glutamate and glutamine in migraine with and without aura. Cephalalgia. 1995;**15**(2):132-135. DOI: 10.1046/j.1468-2982.1995.015002132.x

[167] Pal MM. Glutamate: The master neurotransmitter and its implications in chronic stress and mood disorders. Frontiers in Human Neuroscience. 2021:**15**:722323. DOI: 10.3389/fnhum.2021.722323

[168] Henry-Unaeze HN. Update on food safety of monosodium L-glutamate (MSG). Pathophysiology. 2017;**24**(4):243-249. DOI: 10.1016/j.pathophys.2017.08.001

[169] Zlotnik A, Ohayon S, Gruenbaum BF, Gruenbaum SE, Mohar B, Boyko M, et al. Determination of factors affecting glutamate concentrations in the whole blood of healthy human volunteers. Journal of Neurosurgical Anesthesiology. 2011;**23**(1):45-49. DOI: 10.1097/ANA.0b013e3181f82a8f

[170] Boyko M, Kuts R, Gruenbaum BF, Melamed I, Gruenbaum S, Klein M, et al. The role of hypothermia in the regulation of blood glutamate levels in naive rats. Journal of Neurosurgical Anesthesiology. 2013;**25**(2). DOI: 10.1097/ANA.0b013e31827ee0ac

[171] Hanigan M, Calvert C, DePeters EJ, Reis BL, Baldwin RL. Whole blood and plasma amino acid uptakes by lactating bovine mammary glands. Journal of Dairy Science;**74**(8):2484-2490. DOI: 10.3168/jds.S0022-0302(91)78425-7

[172] Hawkins RA, Viña JR. How glutamate is managed by the blood–brain barrier. Biology. 2016;**5**:37. DOI: 10.3390/biology5040037

[173] Hagenfeldt L, Arvidsson A. The distribution of amino acids between plasma and erythrocytes. Clinica Chimica Acta. 1980;**100**(2):133-141. DOI: 10.1016/0009-8981(80)90074-1

[174] Hashimoto K. Inflammatory biomarkers as differential predictors of antidepressant response. International Journal of Molecular Sciences. 2015;**16**(4):7796-7801. DOI: 10.3390/ijms16047796

[175] Haroon E, Felger JC, Woolwine B, Chen X, Parekh S, James S, et al. Age-related increases in basal ganglia glutamate are associated with TNF-alpha, reduced motivation and decreased psychomotor speed during IFN-alpha treatment: Preliminary findings. Brain Behavior and Immunity. 2014;**46**:17-22. DOI: 10.1016/j.bbi.2014.12.004

[176] Haroon E, Fleischer CC, Felger JC, Chen X, Woolwine BJ, Patel T, et al. Conceptual convergence: Increased inflammation is associated with increased basal ganglia glutamate in patients with major depression. Molecular Psychiatry. 2016;**21**(10):1351-1357. DOI: 10.1038/mp.2015.206

[177] Miller AH, Raison CL. The role of inflammation in depression: From evolutionary imperative to modern treatment target. Nature Reviews Immunology. 2016;**16**(1):22-34. DOI: 10.1038/nri.2015.5

Chapter 10

Perspective Chapter: Options to Violence in Mass Movements – A Prospectus for Mobilization

Toivo Koivukoski

Abstract

Mass movements in the early twenty-first century have taken on a remarkable significance not only in influencing governments and bringing down authoritarian regimes but in demonstrating what more fulsome forms of democratic association could look like. This essay seeks to identify parallel trajectories of contemporary mass movements in terms of common purposes of autonomous participation of people in the decisions that frame their lives, and in the specific modes of organization that have been shared between movements. Between these overlapping ends and means, public spaces for collective deliberation are opened up where the security state and capitalist accumulation have otherwise come to dominate.

Keywords: protest, mass movements, state violence, peace studies, political theory

1. Introduction

> *They must be convinced that an invincible force lives in the people which nothing and no one can withstand; and that if this force has not yet emancipated the people it is because it is powerful only when it is unified and acting everywhere at the same time, in concert, with one aim, and until now it has not been unified.*
>
> *Michael Bakunin, "Statism and Anarchy" [1]*

The mobilization of masses has taken on global significance, with worldwide gatherings of people demonstrating toward, among other things, more democratic, egalitarian, and sustainable forms of social and economic organization, often in the face of the increasingly crisis-prone character of capitalism and the security state.

This chapter will survey some of the mass protests that have spread globally through the early twenty-first century, with the aim of seeking to understand how the reliance on peaceful agitation has been a hallmark of success for some of these mobilizations, in terms of destabilizing authoritarian governments and agitating for greater social and economic equality and justice. Contrariwise, mass movements that have been marked by riots and armed revolution have tended to be more impotent, exposing the state as a monopoly on the use of violence within a territory, [2] while

calling into question not only the legitimacy of authoritarian states but also their own legitimacy as peoples' movements.

While there are robust literatures on the crises of capitalism and its associated imperial politics, from Marx to Lenin, to Kautsky to Hobson,[1] and on the limits of violence, for example in Arendt[2] and Agamben,[3] as well as on the ecological catastrophes borne out of humanity's intra-species domination, thinking here of Žižek[4]

[1] The ultra-imperialist thesis that would be subject to Lenin's critical ire now seems like a rather cogent take on the consolidation of capitalism. Kautsky projects towards an "ultraimperialist," then future historical phase, characterized by the union of separate national empires, largely pacified in inter-state dealings by their agreement not to fight amongst themselves but rather to consolidate and integrate their imperial mechanisms of extraction, transportation, manufacture, and most importantly, re-investment, i.e. the "joint exploitation of the world by internationally united finance capital" ["Ultra-Imperialism" 1914]. This seems very much like the present conditions of globalization, with imperialism turned inwards to systemic, intra-state forms of violence associated with the management of things human and nonhuman, ruled over by an ideological pact to ensure free market penetration for corporations and security for states *vis a vis* one another.

In response to this version of capitalism closing out the historical register, effectively ending any further progressive histories through the pacifying mechanisms of a capitalist imperium, Lenin instead regards Kautsky's thesis as an abstraction from the wars that are the necessary drivers of historical capitalism. He claims that war between capitalist empires is a systemic function of an economy predicated on production for profits, which he sees then driving towards crises borne out in inter-state conflicts [3].

This question of what to do with our social surpluses is crucial for confronting a political economy where patterns of reinvestment are treated as automatic decisions—closed circuits driven by positive feedback responses—wherein excess attracts excess, rather than having surpluses flow, as they should, towards the economic base of the system, that is the people *en masse*.

Here Hobson's speculations on the range of fiscal policy choices available to states seeking to make their foreign policies peaceful and sustainable—as in the redistribution of incomes, differential tax rates, and socially useful spending by states—may be relevant, to the extent that determining fiscal policy remains within the purview of states. Whatever the emergent mechanisms of economic integration, if we judge simply based on historical consequences, we can at least find some evident truth in the observation that the annexation of developing countries incapable of their own self-defence against first-world empires purchases "poor and precarious markets" at great expense, and in the end benefits neither the empire nor the colonized [4].

[2] So Arendt has it, contra Clausewitz and in many ways inverting Agamben's claim of the sovereignty of violence over the political, that "Where violence rules absolutely, as for instance in the concentration camps of totalitarian regimes, not only the laws—*les lois se taisant*, as the French Revolution phrased it—but everything and everybody must fall silent. It is because of this silence that violence is a marginal phenomenon in the political realm; for man, to the extent that he is a political being, is endowed with the power of speech" [5].

[3] Giorgio Agamben [6]. For Agamben, behind the forms of violence that back the law and those that stand outside of it as its sovereign source is another kind: a historical violence that is capable of creating something new, or violence as a transition threshold, as in the Heraclitean aphorism, "All birth is brutal"; or in Nietzsche's critical history as a hammer; or Benjamin's *Angelus Novus*, a wide-eyed angel of the new shoved backwards by a history of destructive leveling passed off as progress [7].

[4] Behind the intellectual bravado and spastic tangents into mass culture, at his clearest Žižek's basic premise for engagement seems to be that: "the global capitalist system is approaching an apocalyptic zero-point. Its 'four riders of the apocalypse' are comprised by the ecological crisis, the consequences of the biogenetic revolution, imbalances within the system itself (problems with intellectual property; forthcoming struggles over raw materials, food and water), and the explosive growth of social divisions and exclusions" [8].

and Kovel, [9] with versions of the critique linking the domination of nature to the domination of our fellow human beings now becoming commonplace in the popular conscience, precisely how those crises function as the occasion for global demonstrations needs to be better understood.

For although they are borne out of a global capitalist system stretched to its limits of integration, these mobilizations are much more than reactions against that system and its conduits: being political acts and laying claim to new publics the movements have shown themselves capable of growth over time, with modes of organization developed in one locale adopted and adapted to new niches for demonstration, with a kind of learning of what it means for a community to be democratic, equal, and sustainable unfolding from out of these global experiments. What will be the consequences of these crises is as undecidable as any political act, it is being impossible to determine just what will happen when a group of people get together and together decide to do something (doing nothing and the absence of action are more predictable in this sense), let alone when masses of people make these kinds of decisions to act the world over. These are movements of multitudes that will determine their purposes, whether realizing them or not, under very fragile and contingent circumstances; considering that realm of ends, therefore, the capacities of theory shade into prayer. What can be discretely understood though are the lessons learned from mobilizations thus far, with certain patterns of growth evident from within these—considering what demonstrations worked, what these demonstrated—quite literally—and what kinds of reactionary patterns of violence these global gatherings of the masses provoked. And though the state-sanctioned violence has been predictably exceptional, exposing the obscene foundations of the security state, the patterns of growth within various movements have been more genuinely surprising, with for example the Arab world teaching the West lessons learned in the specific desire for democracy that is borne out of direct experience with brutal authoritarian states, and in the continuing value of labor unions worldwide in effectively exerting coordinated mass power.[5] These developments within peoples' movements have at times been able to at least intimate how to shift toward more substantial forms of democracy, predicated on economic equality and direct participation in decision-making processes, with those new modes of participatory organization introduced in the Arab Spring revolutions essentially ratified into the constitutions of other occupations worldwide.

2. The miraculous value of peaceful mobilization

Perhaps the signal lesson to be learned from these manifestations of new publics is that the power of masses is enhanced by adherence to nonviolent means. Where we have recently seen amazing consequences of collective action have been in those domains where peaceful agitation has been the distinguishing feature of the assembled masses. Of course, masses *qua* masses need not be peaceful, though dissent and occupation can be. And where violence has been introduced (itself also being a kind of demonstration) the results have tended to be stalemate-prone, with retributive

[5] While the perfect stage of Tahrir Square drew saturated media coverage, the strikes by workers at the port city of Alexandria drew much less attention in Western mass media, though arguably they did more to bring the regime to an end by cutting off its trade. The labour strikes did make clear though that the revolutionary motives of social and economic equality are correlates to the political freedom otherwise denied by dictatorial governance.

cycles of state and anti-state violence making the possibility of political miracles seem that much more distant. For example, to grasp by analogy, Libya and Syria represent two people's revolutions born out of blood, and now seem entrenched in the logics of reciprocal violence, with the cycles of domination there being driven by that violence returned, seemingly with little room for de-escalation, disarmament, and peace for the people.

It is in those instances where people have gathered in peaceful ways that the consequences of their gathering have been that much more unexpected, that much more miraculous, seeming to move easily against the grain of the status quo. So, in the face of a joyous occupation, the police in the tyrant-Mubarak's authoritarian state vanished as if it had gone out like the lights, and in that pregnant void where the state stood back the people stood in and did what was necessary to sustain their newly claimed public space, from garbage collection to community policing. They became their own self-government, both out of the perfect freedom of the situation and by necessity, coming into being as a community precisely in that self-absencing of authoritarian rule, occupying that absence of a commons within a regime otherwise grounded in domination, notwithstanding the failures of electoral politics that followed.

The unique power of these new forms of mass mobilization consists partly in their unexpectedness, arising out of the fact that, whatever the underlying causes of agitation and disenfranchisement may have been, and whatever expectations youth may have for their futures, the actions of people *en masse* are always, to the extent of circumstances, unpredictable.[6]

Consider the students of Québec, for example, going off in the surprising ways that they did in their *Printemps Érable.* They acted, and in so doing laid claim to public spaces—specifically the universities, and squares of cities—as domains suited by right and reason to the cultivation of free association, to public demonstration and individuals' voicing of opinion.[7] This new power of masses, developed out of a history of dissent and made possible by our new technological condition and the accelerated capacity for ideas to spread, in many ways reveals the essence of the political in the unconditioned, such that one can never be entirely certain what will occur when a mass of people gather, speak, and together act. This basic condition is also the condition of possibility for what might be called miracles in the political realm, that is free acts taken outside of deadlocked retributivism, the tragedies of revenge, or just simply the business-as-usual system-logic of orders given, received, and followed. A free act is in this sense unprecedented, and thus justifies the moniker of miracle, though as worldly and secular a miracle as nature and history would allow. Thus Arendt has it that:

> *... it is not in the least superstitious, it is even a counsel of realism, to look for the unforeseen and unpredictable, to be prepared for and to expect "miracles" in the*

[6] On what young people might expect, consider for example the imposition of economic austerity measures onto the masses, while a corporate elite arranges for society at large to invest in and insure collectively accrued risks. What results, symbolism-wise, is a gesture of nonconfidence by which the helmsmen of a civilization effectively bet on their own failure.

[7] The pulsed series of strikes in Québec was distinctive in its sustained, coherent episodes of direct action, united by the goal of a universally accessible education as social and economic right, and by resistance to a system that indentures students to lifetime debt and corporate suzerainty. Its unity as a movement is also what makes it so singularly heterogeneous in relation to the capitalist ethos on campus, in the sense that "...at the heart of the uprising is a subjectivity in revolt against the idea that the paradigm for everything is business." ([10], in [11]).

> *political realm. And the more heavily the scales are weighted in favour of disaster, the more miraculous will the deed done in freedom appear; for it is disaster, not salvation, which always happens automatically and therefore must always appear to be irresistible [12].*

Or as Žižek enthuses:

> *... the "Real as impossible" means here that THE IMPOSSIBLE DOES HAPPEN, that "miracles" like Love (or political revolution: "in some respects, a revolution is a miracle, " Lenin said in 1921) DO occur. From "impossible TO happen" we thus pass to "the impossible HAPPENS"- this, and not the structural obstacles forever deferring the final resolution, is the most difficult thing to accept [13, 14].*

Manifestation is the French word to describe this kind of space, which beautifully captures the sense of these mobilizations as a coming to presence of a new public, one that includes particular struggles without obliterating their uniqueness, sublimating them into simple messages relating to the desire for autonomy, for direct participation in the terms of one's life, for an education that does not automatically indenture a student into a life of indebtedness, for a truly fulsome democracy, and a more just economic system. The idea that something is being manifest through the public gathering is indeed a telling notion. So, what is it that is manifest as new publics come into being in what are effectively the ruins of an old order, i.e. in states without security, and under capitalism without real growth?

And from the other side of the barricades, how are the new publics being portioned off at the sub-constitutional level of intra-state violence, specifically when demonstrators are lined up against or penned in by truncheon-wielding officers of the supposed peace? No Heraclitean aphorism or grace of stupidity could wrap together those opposite terms of peace and violence,[8] and whatever circuitous routes may connect those poles in the skein of world events, the basic principle of the inherent freedom and equality of individuals cannot hold in the face of this kind of treatment of persons *en masse*, with patterns of organization based in domination being ultimately incommensurable with any egalitarian form of democracy.

Consider, for example the legal and street-level violence deployed contra the student and anti-capitalist street protestors in Québec, who themselves came together in a properly carnivalesque way, acting out as a reverse-engineered spectacle to reflect on that other, everyday spectacle, thus to be revolutionized—inspired by critical righteousness, sustained by strikes by those with nothing to strike with, save the mere presence of their bodies (and their kitchen pots and pans). Against this regular massing of many thousands in the streets and other public places centered in the large cities of Québec, and consisting of a range of people—from the committed student and cause activists, to school peers, to engaged bystanders, or even those simply occupying the same space—was manifest the sovereignty of the state against its people, banning spontaneous gatherings of more than 50 and armed with weapons designed to be used, thus demonstrating itself specifically *as* a so-called security institution in its displays of violent capacities. In the case of the Québec student protests against tuition hikes, these included the use of rubber bullets, tear gas, pepper spray, flash-bang grenades, shields, and truncheons against people otherwise peacefully gathered

[8] As in Heraclitus' claim that "War is the father of all things and king, it shows some as gods and some as humans, some it makes slaves and others freemen." (my translation) §44.

in the streets and public squares. What is remarkable is how this militarization of crowd control has become a new normal and a default response for states whenever a mass of people gather together for the purposes of demonstration.

That very capacity to gather autonomously in the absence of modes of domination—that is peaceful, free association properly so called—is precisely what is so elusive and so threatening to modern-state formations, which take their basis rather differently from their sovereign authorization to the use of force. What we are witnessing in this impasse of two distinct ordering principles, the one essentially democratic the other inherently hierarchical,[9] is an incommensurability in principle translated into an antipathy of means. So, from the divide between free association and corporate/military hierarchies arises a corresponding political division, as where a gathering of individuals actively expressing solidarity is penned in or "kettled" by a militarized phalanx of riot police, Cyclops masks of human beings with whom, at that precise moment of preventative mass detention, there is no talking. That is the limited power of the state remaining under these circumstances—the power not to respond, whatever crises of legitimation this may engender.

Or as Giorgio Agamben frames the concept, drawing rather notoriously on the political theory of Carl Schmitt, the sovereignty of the state is set apart by its singular difference: "the sovereign is truly the one to whom the juridical order grants its power of proclaiming a state of exception." The violence coming from states in response to the global surge in popular protests is in this sense exceptional; for however predictable the episodic, mass resistances of erstwhile invisible populations may have been in hindsight, this kind of intra-state violence must have an astounding quality to it, considering how it acts out beyond any social trust one may have in either peace or civility, being beyond legitimation and manifestly contra to the freedom of groups and individuals.

3. Thinking beyond the Arab Spring and occupy

For neither the communitarian discourses of individual versus communal rights nor the classical liberal conception of overlapped and hence contested rights claims can account for this conflict between states and the citizens who protest against them. There is in this new instance an ontological separation of state and subject, with the two now drawing on essentially different powers. It is no longer realistic to suppose that the sovereignty of the state is drawn directly from the amalgamated powers of individual bodies, as in the modes and orders of *lo stato* that Machiavelli first heralds as the modern state, consisting at that time of the strength of a citizen-standing army]. Rather, in a contemporary state-as-machine for the production of social order, bodies are not seen as the collective source of power, rather they are the subjects of sovereign power. This is the dissonant pattern then witnessed, whereby states use violence (both visceral and economic) to manage the movements of bodies, while those bodies cry out in a political language alien to the technocrats and riot police both,

[9] ...as in a mode of neo-liberal suzerainty, where technocrats legitimize the function of wealth in terms of efficiency while oligarchs legitimize the calculations of the technocrats, simply by their being rich, in a regime that is its own *fait accompli*, a perfectly self-referential mode of kleptocracy coded to diminish autonomy via the regulation of the political process, with priority given to economic drivers and an efficient social order.

making claims to a justice that transcends efficiency, speaking out toward miracles in an otherwise lock-step world.

This is part of the reason why the actual presence of bodies gathered is essential to these movements, which, at a meta-level and enveloping causes as diverse as accessible education, social and economic equality, anti-capitalism, anti-authoritarianism, Indigenous rights, etc., draws its power from all that remains of a people and a *res-publica*, that is the very fact of their being in public. The more fragile and exposed those public bodies are, as in for example the nude marches deployed against armored riot police in the Québec student protests, the more impotent the physical violence of the state is made out to be. Referring to the pointless failure of the 2005 Paris riots (to which one could add the similarly pointless 2011 riots in the UK, or likewise the "freedom convoys" and occupations in 2022) Žižek observes that, in the case of both the rioters and the riot police "we are dealing with blind *passages a l'acte*, where violence is an implicit admission of impotence."[10] So, youth riot because of their own sense of invisibility and powerlessness, while masked police react violently against violence engendered by their very presence, with each claiming the justification of the other's existence. This kind of anticipatory and self-fulfilling violence shows itself to be a more brutally efficient form of robotic politics than preventative mass detention even, where the end of crowd control is to protect the crowd from itself by detaining it *en masse*, precisely before any harm occurs. Notwithstanding the obvious point that the mass detention itself could be taken as a harm, the action takes its self-legitimation from the fact that because of this violent act of corralling a group of innocent people, nothing happened.

In both cases, the violent act demonstrates its own cause and effect, and in this sense represents a kind of politics beyond legitimation. Rather, the free act and peaceful gesture (as in the iconic images of peace signs flashed at riot police, or flowers placed in rifle barrels during anti-war protests) have their basis of possibility in the dangerous situation of those protesting bodies, in which that specific danger is projected as a demonstration of the precariousness of the body politic as a whole at that particular moment of crisis.

This is action well beyond old anarchist tactics of shaming the state into showing itself for what it is through provocation, exposing it as a monopoly on the use of organized violence. This fact is now plainly acknowledged; much as the imperial realities of neoliberal foreign policies are enthusiastically endorsed by ideologues as instrumental to a new world order, it seems that, within the new normal, there should be little surprising about state formations stripped down to their rudimentary, and often rude security functions, as if that were the *sin qua non* of the new social contract. Rather, here disobedience against civil government takes on its symbolic function in making a spectacle of the precarious exposure of those who are the objects of policy and policing, those two being a pair of perversions of the Greek root *polis*, corrupted from public forum into domain for the management of things human and nonhuman.

Beyond breaking through this kind of Hegelian "bad infinity" where the rationalization of society into an efficiency-driven machine gives rise to its own unintended consequences, which in turn occasion greater rationalization, and so on, the retrieval

[10] Slavoj Žižek [15]. See also Jacques Ellul [16]. In consideration of the distinction between peaceful demonstrations and riots against the technological system, according to Ellul "Order receives our complete approval: even when we are hostile to the police, we are, by a strange contradiction, partisans of order".

of the sentiment of solidarity in the crowd offers a place from which to reflect on otherwise seemingly inexorable logics of domination. For the mere peaceful, physical presence of others offers a powerful rejoinder to the mandate of the security state and the politics of fear that sustains it. Here the protest chant <*Who are you protecting?*> rings true both as commentary, while demonstrating, again quite literally, that the peaceful organization of masses of people can be achieved in the absence of coercion. Contrariwise, physical domination is shown to be more tuned to the breaking up of gatherings, though even there with limited successes.

For what more visceral form of solidarity is there than the ancient pathos of sympathy, of a shared plight? To share in the suffering of others is a basic form of union. In this sense, for example the 2001 Québec City demonstrations at the Summit of the Americas brought back less in the way of policy options, beyond the inherently right-minded principles that autonomy is important, that preserving labor rights and environmental protections constitute the ennobling claims of peoples to their work and their lands. What did emerge as novel and shocking from out of that summit were the lasting wounds on Canadian civil society, as evidenced in the scars and bruises borne by the protestors' bodies. These would become spurs for further community involvement and physical proof that if the state was not necessarily there to protect them, functioning as some kind of abstract, neutral third-party mediator of differences, then all that they could truly believe in were the people linked together by their shared presence. Beyond regulated behaviors, what could be trusted was that simple presence of others, demonstrated through the linking of arms, the treatment of the wounded, or the push of the crowd marching together.

What is interesting, as we progress beyond episodic assemblies paired up to coincide with state-sanctioned summits, is how articulate these manifestations of solidarity can become, as if developing out of a Rousseauian *amour de soi* that sees the world undivided as an extension of self, to one that can at once register the existence of difference, and hence act politically, and at the same time self-divide so as to portion out the respective dimensions of trust, sustaining all those day-to-day, street-level assumptions that we make about our social environment and collective responsibilities. So, we would trust that the commons will be unpolluted, that food and water will be available, along with a place to sleep; and beyond those basics we would trust that there will be something interesting to see and to listen to out in the streets. And as these communities of dissent grow, they demonstrate how these trusts could be secured through other means, on the basis of free association, with volunteer sanitation crews keeping the public parks fit to occupy, food distributed by on-site kitchens, lending libraries housing books (perhaps the most beautiful excess of the Occupy movement has been the "people's library" phenomenon), [17] and General Assemblies of the whole punctuating days of simply being there together, along with the constitutive chance to say what is really worth doing in the company of others.

In terms of a reason why these occupations occur, and what holds them together, it is commonplace to understand them in relation to some term of opposition. So, the Tahrir Square occupation is counterposed to Mubarak's authoritarianism; the Spanish Indignats' *acampada* set in relief against austerity policies; "I Am 132" as against the corporate monopolization of national media; OWS against, as the acronym implies, Occupation Wall Street as a center of corporate capitalism, etc.. Interestingly, however, that last occupation took place not on Wall Street proper, but in a kind of liminal space between private and public, where concessions on the owner of the

property to allow public access restricted the leeway given to the City authorities to clear Zuccotti Park. The point about zoning allowances is raised by Nichols Mirzoeff, whose observation points to interesting potentials for autonomous association, "in the variant space between the security-regulated public commons and the deregulated zones of the neo-liberal market" [18]. As in the *#YoSoy132* or "I Am 132" movement in Mexico, the identity of the movement is wrapped up with something that is presently empty—the absence of an egalitarian public forum—that is to be filled in. Jane Jacobs' practical concept of urban in-filling fits wonderfully here—as in Occupy from an urban planning perspective—where one first identifies an absence and then gathers with others to fill that void [19, 20].

This suggests a shift in the orientation of protests, no longer turned against something and thus reducible to that anti-cause, and giving rise to the familiar interrogation of <*Well, what would you have us do instead?*>, a trope invoked even among allies, as in Žižek's injunction that "we will have to address the truly difficult questions- questions not about what we do not want, but about what we DO want." [21]. Here instead we find demonstrations coming into being at a distance from the supposed origin or anti-cause of the movement. Another parallel example would be the protests against Bay Street and the center of corporate finance capitalism in Toronto, Canada, which after some debate, were set up at the more hospitable setting of St. James Park. The point is not simply one of amenable convenience, though the practicalities associated with an encampment (sleeping space, sanitation, livability, and view) certainly figure into the sustainability of a situation.

Rather, in these instances, we have demonstrations arising not precisely against but rather out of a certain set of circumstances, at a new merger of the private with the political. In this sense, the circumstances that are protested against are also what make the protest possible, not in the limited sense of liberal accommodation of otherwise flattened out differences, but as crises that contain their own causes of overcoming, here the demand for autonomous participation in setting the terms of one's day-to-day existence. In this sense, what the post-political landscape of efficiency and profit-oriented policy options give rise to is a more fulsome appetite for the political properly so-called, with people desiring a direct say in the decisions that affect their lives, forming associations toward something that "is in the view of those involved, a good."[11]

4. The power of consent

If the distinguishing feature of these new social movements consists in their autonomous claims to free association, with their capacities for peaceful organization contingent on their being nonhierarchical, nonviolent, and democratic (bracketing the question of violence in its modalities, from violence as exception to the systemic violence that underwrites episodic outrages of ultra-violence),[12] then the

[11] Aristotle, *Politics*, (my translation) 1252a.

[12] Consider along these lines Žižek's distinction between "subjective," "symbolic," "systemic," and "divine violence" (the later category drawn from Walter Benjamin) in *Violence: Six Sideways Reflections*, New York: Picador; 2008.

deliberative formation of these common goods, and thus of communities, will have a constitutive role for each of these communities in their uniqueness, as well as for a global peace movement.[13] This is one of most concrete senses in which the movement is in fact a whole, in that its deliberative mechanisms for speaking out of dissent and toward consensus have been shared and developed as they have spread from site to site, masses to masses: Tahrir Square to Pearl Roundabout, Indignats to Occupies worldwide, have all drawn on a still developing yet quite functional constitution, wherein a people is constituted by their terms of association, freely agreed upon by all members of the community, with the terms of their consent contingent upon their actual approval, each approving individually what is done on behalf of the whole. This living constitution, described in terms of a new way of doing politics—as in a new set of customs and modes of social organization— is essentially ratified for the purposes of any particular occupation within its General Assembly. At that level, the organization is distinguished by the physical presence of its constitutive members, in an embodiment of the political complimented by the virtual presence of worldwide witnesses along with other, similarly coded organizations—where the on-the-ground forum is spectrally linked to a network of other Occupations and actions. What makes these alike is that evolution of democracy encoded in the new terms of consent, thus:

> *We affirm that consent is not just the absence of a "no," but the presence of a "yes." [25]*

The modes of direct democracy hinge upon the active expression of consent, embodied in the *<yes>* that each says to all. At the most visceral level, this is the amplification of one by all in the "human mic," with the repetition of a speaker's words, clause by careful clause, empowering the many to have their collective voice heard, while each individual is asked whether they would make those words their

[13] Here is where the provisos begin to be piled on, as commentators seek to trace out striations of affinity between demonstrations, suggestive lines of connection imprinted as if by some glacial movement onto the epoch, while at the same time emphasizing the uniqueness of each as embodied modes of resistance to capitalism. Thus, however situated each claim to a more just community is, the demonstration remains as systemic as its occasion. The qualifiers that register the movement as one consisting of multitudes, and thus as a whole dependent on the recognition of differences within, are crucial to the capacity of the movement to articulate itself over time, to democratically decide what it will become, to change and to grow. The theoretical effort, therefore, is not to "unify this collectivity under a substantial identity—race, ethnicity, religion, nationality. Rather it asserts it as the 'we' of a divided people," [22]. Similarly, in linking demonstrations from the Arab Spring, to the Spanish *acampadas*, to the Wisconsin statehouse protests, to the Israeli tent encampments, to Occupy, Hardt and Negri are careful to register that "The context of these various protests are very different, of course, and are not simply iterations of what happened elsewhere. Rather, each of these movements has managed to translate a few common elements into their own situation" [23]. This pattern of equivocation—*<it is one, but many>*—runs in parallel with the renewed discourse around empire that preceded it, wherein the definition of what empires have become took on all kinds of qualifiers (from "empire-lite," to "*hyperpuissance*," to "liberal empire"), suggesting that the systemic sense of a whole that our technological society induces is punctuated by and concentrated in nodes where power is actually applied. So, while contemporary forms of empire may be de-territorialized, or seemingly virtual, they most certainly do touch ground and occupy territory, linking the sites of power within a system of domination, here recovered as a system for resistance. On this theoretical shift in the meaning of empire [24].

own.[14] Thus, active consent is ascribed at every stage in the articulation of an action, with the power to block a proposal that may oppress or exclude retained by each individual member of the community. Clearly, this is a kind of arrangement that requires patience, and that would be sustained only by the common desire to organize with others.

Here then, at the level of the gathering of the whole, the deliberation toward working consensus has a constitutive function, with the people as such emerging in their distinctiveness from out of that dialog. As a matter of course then, and after the theoretical fashion of what has been called "the undecideable" (Mouffe) or "the danger" (Heidegger), the constitutive deliberation of a General Assembly has an open-ended quality to it: it is the kind of discourse that can never be settled, any more than a people's identity can be resolved and rendered final, save in its dissolution.

If the principles and power in Occupy's organizational structure reside within the mandate of the General Assemblies, then what may be called its executives, or the Spokes Councils, perform service functions to the assembly of the whole, making it possible and sustainable for the people to be there together. Much as in the democratic regimes that at times prevailed in ancient Athens, the executive is regularly cycled, with what might be called political offices, here literally a specific place within the group—sitting at the hub of the spokes—freely and regularly exchanged. Committee membership is open to all, and the power to decide is shared by all. While the nodal structure of the Councils, arranged as rotating spokes of a wheel, allows for reporting by offering an accountability mechanism to relate part to whole, the fealty to direct consensus even at that operational level means that it would be both impractical and unprincipled for the Council or for any other working group or caucus to claim rights to speak on behalf of the General Assembly without the whole being gathered and consent conferred. This is not to say that a committee could not be mandated by the General Assembly to serve the collective as its diplomatic corps, thus allowing action initiatives to spread meme-like through occupations. This would be one effect empowered by the new capacity to communicate worldwide, that is, coordinated global actions. That power to say *<yes>* to a proposal by voicing it for oneself or to block a proposal (as a contravention of the constitution of the whole) can only derive from the people present. That is to say, in these new modes and orders of organization, these new ways of interacting and new principles of association, there can be no legitimate claim to speak on the behalf of others.

This is the great strength of these movements and a source of their distinctive coherence, and also their most significant challenge at the system level, understood in terms of the coordination and amplification of actions from one Occupation to another. That is, as it is constituted executives do not possess the power of being somehow representative of their respective General Assemblies, in order to address other Councils or Assemblies. Those kinds of external communications could only originate out of the General Assemblies themselves, in a structure where the outside

[14] It is interesting to hear Žižek give his staccato speech to an open air, OWS forum in Zuccotti Park, especially when the speaker pulls out an old Marxist line, to the effect that the revolution is not an action, that they are not the real dreamers, that praxis is rather an energizing of an already existing crisis situation, that it is the system itself exploding, with the subject reduced to a kind of puppet of the historical moment, etc., and as if missing their cue to mirror a prestigious thinker, the human mic pauses. It was natural that the demonstrators did not jump to repeat those words, since they were most certainly committed to acting freely, whatever the context of the situation that made that action necessary. [Internet] http://www.youtube.com/watch?v=eu9BWlcRwPQ [Accessed: June 10, 2022).

aspect of the group is in a sense internal to its constitution, arising from the inside out. Any attempt to represent here would dissolve into so many words, lacking the legitimating social substance of consensus. So then, how does a movement articulate itself as such? To the extent that the notion of the external is meaningful in a networked world, where delimitations of inside and outside are self-selected boundaries, contingent on the potential range of an action—always a provisional assumption—the pattern of the external relations between occupations worldwide is less one of speaking out to the world than it is of bringing the outside world into the community, ratifying and thus amplifying organizational modes (i.e. *Community Agreements*) and principles (i.e. *Principles of Solidarity*) within a particular situation. These codes for discourse shared in recombinant applications and developed in response to the necessities for coordinated global action gather together the ideas of others freely shared with what one would willingly say for oneself, thus effectively, in the end (this is the hope) doing unto others as they would have done unto themselves.[15] Thus, what remains of executive function takes on its proper role in the service of others, with only those others then capable of speaking their interests and desires for themselves. All legitimate authority is mandated directly, with all of those mandates responsible to the assembly as a whole, that is the people.

This would be the political aim of the movement as a whole to realize that claim to direct autonomy. This would be claimed through direct participation in the terms of each person's day-to-day life, with that autonomy of the person to be decided in the workplace as in the streets, through the demonstration of more democratic forms of social and economic organization.

5. Conclusion

That this potential arises out of an ominous situation—encompassing crises of humanity and of nature—is as manifest and clear as its consequences are dangerously uncertain. Massive social movements can of course go in several directions, and it is abundantly apparent that authoritarian, fascistic, racist, and other violent forms of mobilization and occupation inspired by fear and hatred are also possible responses to the freeing up of political subjectivity, now at once liberated and dominated by the technological transformation of our public places, both at the street level and virtually. Even more dire, perhaps, is the decline of the middle class and the radicalization of economic inequalities, with a reactionary oligarchic class desperately trying to cordon off its assets from the very public that has hitherto insured the risks of corporate capitalism via the states they legitimate. The apparent impasse between private profits for corporations and collectivized risks for the public exposes an unsustainable situation, with the prospectus for social change borne out of that specific division of interests, becoming clearer with each new crisis of corporate capitalism.

[15] On this inversion of the Golden Rule [26]. Huang proposes a cross-cultural ethic along the lines of the Golden Rule with a reflexive twist—that one treat others as **they** would like to be treated—a dictum that raises the baseline observation that ethics begins with difference; for if one were to begin with some sort of universal, then there would be no need for an ethos or a way in-between. We begin with our own differences to be confronted by the differences of others, wherein what may at first seem singular comes to appear as a manifold of appearances, with what overlaps between differences then emerging out of a sharing of what one lacks in oneself with the others who we need.

Now that there has been this wellspring of popular mobilization for a more democratic economic system and for direct participation in public life, what remains to be seen is how new modes of organization, so clearly needed in the absence of effective leadership from a corporate oligarchical class, can be applied to places of work and other instruments of the economy, as well as exert influence on civil society broadly construed. The *Yo Soy 132* youth movement in Mexico gives a powerful suggestion of such potentials, specifically to democratize the political framework at a systemic level, including the structure of mass media, through mass actions capable of meme-like spread from one place and public to another. And beyond this, there is the question of how these various occupations of what are presently empty sites of power—abandoned factories and stores, foreclosed homes, and evacuated city streets—can be linked together in common struggle for the public good. For here, we reach a crucial point in the building of more just and democratic communities via the reclamation of public spaces, wherein the interests begin with justice here and now, and extend to the relations between these emergent power units. That is to say that something like properly democratic relations could be had between occupations worldwide, whereas true democracy seems to have proven impossible between states, being unequal as they are in their sovereignties, and apparently incapable of transcending those inherent differences. This task of transformation, therefore, now belongs within the purview of the people and bears out the shared responsibility of our time: to either watch the world perish while a few profit or to build a better, that is more democratic and sustainable system. Risks can only be engaged in common, with full and freely willing participation, when all have made their wagers freely. However uncertain the consequences of collective actions may be, this legitimizing claim to consensus may ground common trusts even as the world as we know it falls apart.

In her reflections on the global surge in students' movements in the 1960s, Arendt insists upon the mere instrumentality of violence, as well as its increasingly apparent uselessness, when confronted by technological developments such as nuclear weapons and weapons of mass or indiscriminate destruction [27]. She makes a distinction that is perhaps even more apparent in the early twenty-first century between violence as a tool, necessary in strictly limited justifications of self-defense, and the power of mass movements. This power consists in the capacity for coordinated action on the basis of free association.

If violence and the responses to it are grindingly, tragically predictable, then the power to act in concert with others is uncertain both in its origins (i.e. apathy could set in and nothing could happen) and in its outcomes. While observing that the student movements she was witnessing then seemed to share in some common quality, and constituted a "global phenomenon," she is quick to point out that the phenomenon as such was not bound together by a singular cause. For if it were, then this determination would essentially limit the movement, as if according to some overarching historical necessity. This would make it something other than political action as such, which must act out beyond such determinations if it is to draw on the power of the people:

> *A social common denominator of the movement seems out of the question, but it is true that psychologically this generation seems everywhere characterized by sheer courage, an astounding will to action, and by a no less astounding confidence in the possibility of change.*[16]

[16] *On Violence*, 15-6.

Fear in the face of violence is predictable; courage is not. The power to act in this sense is by no means a given, however catastrophic that precariousness may turn out to be.

There is some real truth in the observation from the origins of Western political theory that democracy represents a way for the masses to protect themselves against the powerful few, that is contra those who claim the privilege of doing injustice, and who must, therefore, be forced to honor claims to equality.[17] If social contracts hold in this sense it is because they are agreements autonomously chosen, and against those who claim the right to domination only the power of the people can succor them both justice and equality.

Conflict of interest

"The authors declare no conflict of interest."

[17] Consider, for example, the portrayal of democracy in Plato's *Republic*, at 359a-c, where the masses form agreements amongst themselves on what is just so that they are not dominated by a wealthy few. For more on the tensions between democracy and oligarchy, originally expressed in classical political theory and adapted to contemporary global politics, see on [28].

Author details

Toivo Koivukoski
Political Science, Nipissing University, North Bay, Canada

*Address all correspondence to: toivok@nipissingu.ca

References

[1] Bakunin M. Statism and anarchy. In: Shatz MS, editor. The Essential Works of Anarchism. New York: Bantam; 1971. p. 182

[2] Weber M. Politics as a Vocation in The Vocation Lectures. Indianapolis: Hackett; 2004

[3] Lenin VI. Imperialism, The Highest Stage of Capitalism. Peking: Foreign Language Press; 1973

[4] Hobson JA. Imperialism: A Study. New York: James Pott & Co; 1902

[5] Arendt H. On Revolution. London: Penguin; 1963. pp. 18-19

[6] Agamben G, Sacer H. Sovereign Power and Bare Life. Stanford: Stanford University Press; 1995

[7] Benjamin W. Theses on the Philosophy of History. New York: Shocken Books; 1968

[8] Žižek S. Living in the End Times. London: Verso; 2011

[9] Kovel J. The Enemy of Nature: The End of Capitalism or the End of the World. London: Zed; 2007

[10] Badiou A, Gauvin F. Lenjeu philosophique mondial du conflit étudiant. Le Devoir. 2012

[11] Barney D. The truth of le printemps érables. Theory and Event. 2012;**15**:3

[12] Arendt H. Between Past and Future. New York: Penguin; 1977

[13] Žižek S. On Belief. New York: Routledge; 2001

[14] Machiavelli. The Prince. New York: Norton; 1992

[15] Žižek S. Violence: Six Sideways Reflections. New York: Picador; 2008

[16] Ellul J. The Technological Society. New York: Vintage; 1964. p. 103

[17] Hardesty M. OWS and People's Librarians File Federal Lawsuit against the City for 11/15 Raid on Zuccotti Park. 2012. Available from: http://peopleslibrary.wordpress.com/2012/05/24/ows-and-peoples-librarians-file-federal-lawsuit-against-the-city-for-1115-raid-on-zuccotti-park/. [Accessed: June 10, 2022]

[18] Mirzoeff N. Occupy Theory. 2011. Available from: www.critinq.wordpress.com/2011/10/26/occupy-theory/. [Accessed: June 10, 2022]

[19] Jacobs J. The Death and Life of Great American Cities. New York: Random House; 1961

[20] Jacobs J. Dark Age Ahead. New York: Random House; 2004

[21] Žižek S. Actual Politics. Theory and Event. 2011;**14**(4). Available from: https://muse.jhu.edu/article/459212/summary?casa_token=GkdbYWmK0coAAAAA:dEoGlgpN_AwFdha8mFOYfpbXjaaWfrn7iZ8S4_bhlyJJwA2IWoUsGMuBQ4VBnJOcodRGeXxA

[22] Dean J. Claiming division, naming a wrong. Theory and Event. 2011;**14**(4). Available from: https://www.researchgate.net/publication/254963772_Claiming_Division_Naming_a_Wrong

[23] Hardt M, Negri A. The fight for the 'real democracy' at the heart of

occupy wall street: The encampment in lower Manhattan speaks to a failure of representation. Foreign Affairs. 2011. Available from: https://www.foreignaffairs.com/articles/north-america/2011-10-11/fight-real-democracy-heart-occupy-wall-street

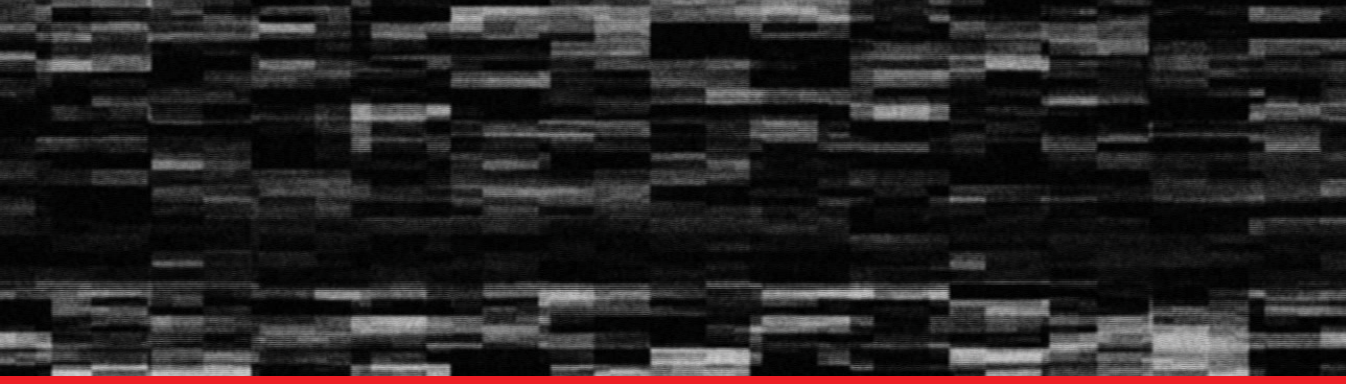
[24] Tabachnick D, Koivukoski T. Reflections on Empire: Ancient Lessons for Global Politics. Toronto: University of Toronto Press; 2008

[25] Community Agreements (a living document). For an Example, See the Community Agreements Adopted by the General Assembly of Occupy Wall Street: [Internet]. Available from: https://peopleslibrary.wordpress.com/2012/03/10/community-agreements/; https://macc.nyc/img/assemblies/OWSStructure.pdf. [Accessed: June 10, 2022]

[26] Huang Y. The Ethics of Difference in the Zhuangzi. Journal of the American Academy of Religion. 2010;**78**(1):65-99

[27] Arendt H. On Violence. New York: Harcourt; 1970

[28] Tabachnick, Koivukoski, editors. Oligarchy: Ancient Lessons for Global Politics. Toronto: University of Toronto Press; 2011



Edited by Catherine Lewis

This book is a collection of theoretical perspectives and research studies from international scholars on neuropsychological aspects of aggression, personality features, gender-based violence, and cultural origins of conflict. Written by experts in the field, it offers insights into multi-theoretical perspectives on aggression and violence and the multifaceted factors involved in the etiology and management of conflict. This useful resource presents perspectives from Western and non-Western frameworks of violence, broadening the spectrum of the shared knowledge base.

Published in London, UK

IntechOpen

ISBN 978-1-80355-308-5